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# Representations of Gender in Math-Related Films

The idea that men are better at math than women is one of the most entrenched gender stereotypes. So, when toy manufacturing giant Mattel released its Teen Talk Barbie in July 1992, the company didn't think twice about including "Math class is tough!" in the doll's repertoire. To their surprise, however, this led to an immediate condemnation of the doll and the company, who announced in October of that year that they had erred. They offered a doll swap for anyone who wanted and switched out the Barbie doll that used the phrase with one that didn't (The Associated Press). However, the damage had been done. The story hit presses across the country, including national papers like the *LA Times*, *Chicago Tribune*, *The New York Times*, and *The Washington Post*, among others. Discussions on gender disparity in mathematics rose to the forefront like never before, starting with a stern denunciation of the doll by the American Association of University Women. One member of the association took to the editorial pages of the *Chicago Tribune*, saying, "Every message that is sent, even the seemingly innocuous one from a doll, reinforces a stereotype we must break, for the sake of our girls as well as our boys, for the future of our country. When we shortchange girls, we do indeed shortchange America!" ("The Strength of Words"). The final line of that statement cited the AAUW's February 1992 study "How Schools Shortchange Girls." In it, the AAUW provided a list of recommendations that directed girls toward careers in math and science just as much as boys. Teen Talk Barbie further legitimized their concerns.

Now, in 2024, it superficially seems like things have turned around. More women are taking advanced math classes than ever before. The AAUW's 1992 study on the gender disparity in mathematics education found that 64 percent of boys who had taken physics and calculus planned to major in science and engineering – both math-related fields – in college. In contrast, only 18.6 percent of the girls who took the same subjects had similar plans ("How Schools Shortchange Girls"). That seems to have improved by the current day, although modern data

doesn't exactly match the parameters of the AAUW report. For example, 48.2 percent of high school AP Calculus AB and 41.8 percent AP Calculus BC test takers are women ("AP Program Summary"). However, that doesn't mean the problem has gone away; it still exists in higher education. In the 2020-21 academic year women earned 42 percent of degrees in math and statistics at the bachelor's level, 41.4 percent at the master's level, and 27.9 percent at the doctorate level ("Degrees in Mathematics and Statistics"). So, although things may look peachier for high schoolers, the outlook beyond secondary education is still dire.

The issue of closing the gender gap in mathematics is daunting, and to tackle the entire thing at once is virtually impossible. So instead of that, I'm going to do something that sort of mirrors Mattel's Barbie arc over the last 30 years: move from the real world to the big screen. Specifically, I plan to analyze representations of gender in math-related films. As we move increasingly into a digitalized world, we find less significance in the toys children play with and more importance in what they watch on a screen. And as I've identified higher education as a particular concern, math-related films are even more relevant for college students than the little ones. As cultural studies professor Carol Colatrella put it in her 2011 book *Toys and Tools in Pink: Cultural Narratives of Gender, Science, and Technology*, "Social conventions and stereotypes represented in literary and cinematic texts acculturate men and women into following, resisting, or reconfiguring cultural scripts in practicing science and in designing and using technology" (Colatrella 4). Taking inspiration from Colatrella, I aim to show how four math-related films released since *Teen Talk Barbie* either follow, resist, or reconfigure the stereotypes *Teen Talk Barbie* represents.

The four films I selected to closely read were chosen for their notoriety (and thus likely greater cultural impact), staggered release dates (to illustrate change, or lack thereof), and the films' settings of high school, college, or a math-centered workplace. *Good Will Hunting*,

released in 1997, and *A Beautiful Mind*, released in 2001, display the lives of two leading male math geniuses. These films follow almost all of the mathematical gender stereotypes one might expect, indicating limited change by 2001. However, 2004's *Mean Girls* and 2017's *Hidden Figures* switch up the script – just a little in some ways, but a lot in others. Both portray women mathematicians as protagonists, which already rejects math's gender stereotypes. Beyond that, they contain some emphatic resistance and lots of reconfiguration. They include some portions that follow gender stereotypes, too. As I move into analyzing each film, I argue that we've made important steps toward equitable math-related gender representations since 1997, especially with strengthening resolve to resist inequal stereotypes. Full reconfiguration, and hopefully balance, is yet to be achieved. Some components of these films can be used to move us along that track.

Before moving any further, it's important to ask a crucial question: why does this matter? Or, perhaps more bluntly, why care? First off, anyone seeking to live in a more equitable world is likely convinced enough by the disparities in education, which clearly indicate a lack of equality. For those who remain unmoved, another argument rises to the forefront: financial inequality. Much of this boils down to income, which, in a modern capitalist society, equates to power, mobility, and freedom. To start, students who major in math in college are among the highest-paid members of society (Martin). Thus, a disparity in undergraduate math majors directly correlates to a disparity in financial situations. Furthermore, the market for those working math-related jobs is also disproportionately male-dominated. Women make up 44.6 percent of the mathematical science workforce (“Sex by Occupation”), and men with degrees in computers, mathematics, or statistics made \$105,269 a year in 2022-adjusted dollars, while women with the same degrees made \$81,871 (“Median Earnings by Field”). To break this down a little, the disparity in gross number of mathematical science workers is not terrible, especially when compared to other areas of study (“Sex by Occupation”). The over-\$20,000 difference in

median salary is the primary issue. It doesn't come from nowhere, though. Generally, a more advanced degree correlates to more advanced pay ("Median Earnings by Educational Attainment"), which is where the significant gender difference in doctorate recipients rears its ugly head. Two things can be true at once: the number of mathematical science jobs held by men and women are nearing even, but the economic quality of those jobs based on degree level remain distant.

Before addressing any issue, it's essential to understand the problem itself. Something can't be fixed if it's unclear what needs to be repaired in the first place. With that in mind, let's identify and unpack the gender norms that *A Beautiful Mind* and *Good Will Hunting* follow and reinforce.

### **Removing the People from the Math**

The first issue at hand is a disconnect between people and math. In simpler terms, this means that math-related films stereotypically display math as a vague, shapeless entity, accessible only by a select few that possess a natural ability to grasp it. Part of this originates from how people think of math. Oftentimes, they lump it under the umbrella of STEM (Science, Technology, Engineering, and Mathematics). However, this placement falters when it comes to representations of these fields in film. Science has tons of exciting representations, from chemistry's bubbling beakers to biology's genetic engineering. It's much the same in technology – dark rooms with countless screens flashing indecipherable text or the special gadgets in the latest James Bond movie – and engineering – massive construction projects or fantastic mechanical miracles. Now think of math. What physical, representable component of real-life math is exciting in the same way as an unexpected explosion or a gravity-defying motorcycle? Writing on a chalkboard? No. Taking a test? Certainly not. Spending hours just looking at a problem? Make it stop! The point is, math can be pretty boring to represent in film, something

researchers took note of in a 2008 study titled “Mathematical Images and Gender Identities”: “When asked to imagine a world where mathematicians appear on TV regularly, a number of participants resisted this idea. Most commonly they did this by arguing it was impossible or unimaginable or by saying that they and/or others would not watch TV there” (Mendick et al. 37). Because of this, directors and producers represent math in ways that don’t reflect reality or simply have little to do with math at all to make things interesting. Unsurprisingly, these special, played-up representations appear much more frequently in films with a man protagonist than ones with a woman lead.

One way directors make mathematics more fit to be shown on screen is by displaying mathematical symbols and expressions in places other than a typical classroom chalkboard or textbook. In *A Beautiful Mind*, the director does in the form of making symbols and patterns “pop off” different objects throughout the film. The effects used to create this imply that these symbols and patterns are visible only to the film’s protagonist, John Nash. The film utilizes this effect multiple times. The first occurs as Nash is looking down at a table and a classmate’s tie, when their patterns suddenly become highlighted in a glowing, bluish light. This happens again in the bar scene where he and his friends’ plan to court a blonde woman inspires him to come up with the Nash equilibrium, and again when he cracks seemingly unbreakable code at the Pentagon. While these scenes somewhat accurately portray occasions where a mathematician finds inspiration for a problem while taking a break from work and doing something outside of math, this isn’t any different than how “normal” people can indirectly process problems. The representation of the unexplained special effects as the sole inspiration for a solution obscures the past academic efforts of that mathematician to even be able to comprehend the topic they are approaching. It makes mathematics appear unattainable for the general population, despite the fact that math isn’t necessarily any harder than other areas of study, which Yale math professor

Daniel Douglas and Rutgers professor Hal Salzman found in their 2020 study “Math Counts: Major and Gender Differences in College Mathematics Coursework”: “Although some may conclude from our analyses that mathematics courses are inherently more difficult than other subjects, there is little evidence to support such claims” (Douglas and Salzman 104). To make the film more interesting, the director played off the common belief that only a select few are smart enough to do math. Yet, this builds off an idea that Douglas and Salzman illustrated is unfounded.

Another strategy directors use to make math more interesting is one that may seem a little counterintuitive at first: omitting nearly all of it from the film. This makes it seem as though the characters just know math without having to work for it, and watching them impressively cite textbooks or conjure up proofs is apparently significantly more enjoyable to view than watching them do the work to acquire that knowledge. Hollingworth and the other members of her study noted this, saying “Mathematicians do not generally do a great deal of mathematics within the popular accounts of them. When they do it is usually presented as mystifying in a pace and manner which make it difficult to understand” (Mendick et al. 22). This occurs repeatedly in *Good Will Hunting*, with no special effects to play up Hunting’s intelligence. Instead, he simply calls to mind facts and figures with impossible ease, whether that be in math or not. This happens in the scenes where he secretly solves extremely difficult problems on the hallway chalkboards, in the bar where he debates the Harvard student, in court when he cites previous court cases to argue with a judge, and many more scenes throughout the film. What ties them all together is that the viewer is given little background on how Hunting gained this knowledge. The most viewers get is a reference to him having to read something just once to fully comprehend it, which does nothing to make him more relatable.



Portraying math so abstractly creates a perception that math – particularly at increasingly higher levels of education and more intense jobs – is unachievable for everyone minus a select few. Gender enters the mix here in that each of these films features a male protagonist who appears to have that “it” factor to process math at a higher level. This makes it seem as though only men can do this kind of mathematics. In particular, the popularity of these films at the time pushed this idea far, as no films featuring a woman protagonist in this light approached this level of notoriety. With that in mind, I’ll note that the solution here is not to simply make more films with women protagonists portrayed in this way. We’ll get to the why behind that later on. Still, the problem at hand remains.

### **Naturally Brilliant, Independent Mathematicians**

The second way *A Beautiful Mind* and *Good Will Hunting* follow and reinforce stereotypes is through the portrayal of their protagonists themselves. They are shown as both naturally brilliant and fiercely independent – whether that be through their own choice or because they are perceived as being in a league of their own. First, mathematical characters’ natural brilliance inspires a sense of awe in the films’ viewers. This builds off the previous point about representing mathematicians as capable of “seeing” math, an ability that does not originate in hard work or years of commitment. Instead, these characters unexplainably can just do complex math. A particularly poignant example comes in *A Beautiful Mind*, after John Nash’s and his friends’ discussion about courting a blonde woman at the bar inspires him to create what would eventually become his crowning achievement: the Nash Equilibrium. After rushing back to his dorm, the film cuts to a wide shot where the viewer sees Nash writing furiously at his desk through his window in background. The seasons change in a time lapse in the foreground. The use of changing of seasons to mark a passage of time during the instantiation of the protagonist’s highest achievement directs the viewer to connect Nash’s brilliance with nature itself. It seems

perfectly fitting that Nash writes his equation amid nature's great elements. This scene appears to say, "What is more natural than a male mathematician portrayed at the peak of his intellectual power?"

Representations of mathematical intelligence as natural extend beyond literal associations with nature. It can be tied to genetics, too. In one scene of *Good Will Hunting*, Will and Professor Lambeau argue because Will didn't go to the job interview Lambeau set up for him. Will angrily lights one of his proofs on fire, leading Lambeau to dive on the floor to extinguish it in hopes of salvaging the proof. As Will makes to leave, Lambeau says, "Most days I wish I never met you, because then I could sleep at night; I didn't have to walk around with the knowledge that there was someone like you out there." This scene brings up two points regarding the naturalness of mathematical genius. First, Lambeau quite literally states that he can never achieve Will's level of mathematical understanding. Second, and perhaps more subtly, Lambeau's desperate attempt to save the proof Will burns emphasizes the invisible ceiling blocking Lambeau from ever reaching Will's plane of intelligence. That invisible ceiling is represented as Will simply being born as naturally mathematically gifted. Despite likely possessing a doctorate in math and decades more experience than Will, the film says that Lambeau's lesser genetic disposition toward math is a barrier he can never overcome.

Now that we've covered natural brilliance, we can move into another trait these films associate with it: independence. We start with *A Beautiful Mind*, with one of math films' most independent characters: John Nash. Early in the film, Nash converses with his friend Charles atop a building at Princeton. As they talk, Nash criticizes attending class, saying, "Classes will dull your mind, destroy your chances for authentic creativity" (9:45). He tells Charles that he must come up with a "truly original idea to distinguish himself" (8:00). The film later reveals that Charles is a figment of Nash's schizophrenic mind. Because of this, no one ever heard Nash

making those statements in real life, meaning they are entirely created by the director. The entire early part of the film centers on Nash's obsession in attempting to discover a mathematical concept that is entirely his own. When he does, he receives a shower of awards and accolades. This represents the idea that mathematicians must work alone to find true success, and Nash's statements on the roof suggest that doing this independently is the only way to make that success impressive. As the movie progresses, Nash's work becomes more secretive and independent as he believes he is cracking codes for the U.S. government. He never works with anyone on this project, but because of his beliefs in math as an individual venture, he never questions why he must work alone, even if it is a top-secret project. The lack of collaboration present in *A Beautiful Mind* is admittedly essential to keeping Nash's schizophrenia secret for so long. However, it's pretty unrealistic for him to have never consulted with anyone on his project. Had he done so, he may have received help for his illness sooner.

In *Good Will Hunting*, Will Hunting is repeatedly shown as one-of-a-kind. Because of this, the film feels the need to show him in situations devoid of collaboration, because how can he possibly collaborate with those whose intellect is so much lesser than his? That in itself is the surface-level argument for why there is so little mathematical collaboration in the film. However, there's a deeper reasoning here that appears if one scratches a bit at the surface. Hunting is brought into academia because MIT professor Gerald Lambeau is awed by his intelligence and vouches for Hunting to bail him out of potential jail time. In this relationship, Lambeau holds all the power – he can send Hunting to jail at any moment. Eventually, Maguire speculates that Lambeau simply wants to take Hunting's work and claim it as his own, telling him as they argue over what to do with Will, "It's about you, you mathematical dick!" (1:45:00). Here arises the same reason why *A Beautiful Mind* lacked collaboration: the perceived idea in math that an individual discovery trumps any sort of group success. Notice also in Maguire's statement that

“mathematical” is used as a derogatory attribute. Its appearance in an integral moment where Maguire calls out Lambeau’s selfishness implies that math itself is, by nature, a selfish practice.

Highlighting male mathematicians as both naturally brilliant and independent directly contradicts real-world mathematics. For one, the depiction of “natural brilliance” is misleading. Yes, some people do pick up certain concepts faster than others. However, this doesn’t mean those concepts are completely inaccessible for those who don’t get it right away. It also doesn’t mean that one person is always the fastest to grasp every idea. Beyond this point, these films’ dominance of the math-related film category during their time made it appear as though only men could possess this natural brilliance, which in turn negatively affects women’s participation in math. This relates to a study published in *Science* in 2015, where researchers found that fields with greater expectations for natural talent have lower percentages of women PhDs. In this study, titled “Expectations of brilliance underlie gender distributions across academic disciplines,” math had the second-highest perceived emphasis on brilliance, first among STEM fields and second to philosophy (Leslie et al. 263). On top of this, in the case where “natural brilliance” actually exists, multiple studies have shown that women are no less likely to be good at math (Kersey et al. 1). Most of the time, too, this natural brilliance would not provide that much of a leg up for a mathematician in their day-to-day lives. A person’s mathematical work can only go as far as their ability to communicate it, written or verbally. This connects to the fact that mathematics in practice is much more collaborative than these films lead viewers to believe. Personally, most of my college math classes involved lots of in-class group work and discussion. Even in the ones that didn’t fit this mold, where the professor lectured for the entire class, most students went in for the professors’ office hours to get additional help. When I participated in an REU (Research Experience for Undergraduates) in the summer of 2023, I worked in a group of four students and two professors. Every facet of mathematics at every level requires some degree

of communication and collaboration. This is not to say that math doesn't include individual work – it certainly does, just like all other areas of study – but it isn't a wholly individual process like these films might lead viewers to believe.

### **Math Separated from Reality**

All of the natural brilliance and independence shown in these movies results in two things: a disconnect from real life for Nash and a deprioritization of real life for Hunting. This involves both their real-life responsibilities and their romantic engagements. In *A Beautiful Mind*, Nash's entire life revolves around his work. There is hardly ever a scene where he is responsible for anything other than his work, and he fails miserably in the few that are shown, like the one where he leaves his son in a bathtub to nearly drown. Nash always has time to do what he loves: math. *Good Will Hunting* contains the same time flexibility when it comes to working on math. Despite occasionally showing Hunting at his construction job throughout the film, Hunting never misses a meeting with Lambeau or Maguire, although he does complain about missing work from time to time. This shows, whether Hunting agrees or not, that math takes primary precedence in his life. In regard to Hunting's relationship with math, The New York Times review of this film said, "It turns out that Will, the most likably recalcitrant coming-of-age character this side of Gilbert Grape, resists any whiff of success" (Maslin). It is interesting to note here that what Hunting currently does – working construction and as a janitor while hanging out with friends – is not considered successful by either the reviewer or the film itself. Both films represent an ideal situation for mathematicians, or really anyone else who loves doing something: unlimited time to pursue their passion without any of the responsibilities that come with existing as a human being who interacts with others. Because of this, it appears that Hunting is wasting his talents throughout the film.

Another interesting component of the representation of gender in mathematical films comes when movies take their protagonists out of the classroom and place them in an environment that they are stereotypically uncomfortable with: intimate relationships. Take the relationship of John and Alicia Nash in *A Beautiful Mind* for example. It is stereotypical, cringe-worthy awkwardness at its finest, mostly due to John. After Alicia asks John out to dinner in his office, they attend a house party together. As Alicia turns away from John, he unabashedly ogles her bare back and smiles. Later, after the pair have been interacting for a while, John bluntly tells Alicia he would like to have sex with her as they have a picnic. Finally, when John proposes to Alicia, he gives her a prism with mathematical significance instead of a ring. Alicia responds to the proposal with “Give me a second to redefine my girlish notions of romance” (53:00). Each of these scenes display John failing to follow social norms. He crudely expresses his desire for sex, nonverbally and verbally, and he cannot help but allow math to permeate every other facet of his life. On top of each of these scenes, the movie omits Nash’s real-life relationship with Eleanor Stier, who he has a son with but does not marry (Capps 367). Even with all the film does to show how poorly Nash interacts with and treats women, there are still more examples of this from his personal life that didn’t make the cut. Despite all of this, Alicia continues to be attracted to him simply because of his intelligence.

The way the movie itself was filmed also defines where John thrives (math) and where he definitively doesn’t (intimate interactions). In the scenes where Alicia asks John out in his office and when John proposes, John is shot from a low angle when he talks about math or science, making it appear as though he is looking down at Alicia. Alicia, meanwhile, is shot from a high angle, making it seem like she is looking up at John. The angles flip when the topic moves away from math. When Alicia asks John out and when John asks Alicia about their relationship before proposing, Alicia is shot from a low angle, while John is shot from a high angle. This high-low

perspective difference occurs again at the dinner party. When Alicia flirts with John, she stands a stair or two higher than the one he is on. However, once he begins explaining something about a star, he moves to physically stand above her. These differences in camera and physical positioning represent John as powerful when it comes to math and Alicia as powerful when it comes to everything else. If that seems like an incredibly imbalanced relationship, that's because it is, as viewers come to discover as the film plays out. When John is diagnosed with schizophrenia, Alicia takes on the role of caretaker for both him and their son. At one point, she expresses her frustration with her situation to her and John's friend Sol, eventually saying, "I think often what I feel is obligation" (1:20:00). In his 2021 essay "The Imaginary in the Biopic: Deconstructing Convention in Ron Howard's *A Beautiful Mind*" doctoral student Ian Radzinski describes her as "the quintessential supportive wife" whose "steadfast support ... enables John to gradually reintegrate into Princeton and, by the end of the film, lead a classroom of mathematical students and address an auditorium of onlookers as he acquires a Nobel Prize" (Radzinski 49). Even as John gets better, mostly thanks to Alicia's efforts, the film never resolves this critical imbalance in their relationship. John continues to handle the math, and Alicia handles the rest.

Will Hunting's mathematical mind and his sexuality also struggle to coexist in *Good Will Hunting*, albeit more subtly than John Nash's awkwardness in *A Beautiful Mind*. The film almost always depicts Hunting as a charismatic young man with a special gift. However, his interactions with Skylar, an aspiring physician studying at Harvard, indicate underlying challenges with relationships. Once again, this film provides a bevy of examples of a mathematician's relational ineptitude. Will and Skylar first meet at a bar near Harvard in a famous scene where Will outwits a cocky Harvard student in front of Skylar. At the end of the night, Skylar tells Will he's an idiot for not asking for her number. Will gets her number and awkwardly says that getting a coffee together is just as arbitrary as eating caramels. After their first date, Will calls Skylar but hangs

up as soon as she answers. He tells his therapist, Sean Maguire, that he doesn't want to ruin his perfect view of her. Maguire convinces Will to not let that stop him. Instead of calling her back, though, Will tracks her down in her dorm room to ask for a second date. The final, most obvious example occurs when Skylar asks Will to come with her to California, where she will start medical school at Stanford in the fall. Will declines the offer and eventually storms out after telling Skylar he doesn't love her, despite the fact that he clearly does. The awkwardness culminates when Will calls Skylar some time after their argument. She tells him, once again, that she loves him, to which Will responds, "Take care" (1:39:00). While these scenes may feel less awkward than those in *A Beautiful Mind*, they certainly aren't a glowing confirmation that math and sexuality can intersect.

It is key to note here that the male characters' struggles with intimacy does not prevent them from being desirable, as shown by other female characters pursuing them in the films. While films with women protagonists often depict supporting male characters as equal to the women or instrumental to their success, math-related films with male protagonists often show women supporting characters as awestruck of the men's intellect. The men do not need any academic help to succeed. Alicia Nash in *A Beautiful Mind* fulfills this role. She first appears in the film as a student in one of John Nash's classes, which, given that he teaches at MIT, means that the course likely involves some pretty advanced math. Yet, after this first scene, the film never shows Alicia doing any sort of mathematical or even academic work again. It never mentions the fact that Alicia came from a prestigious New York family, thus holding significant power herself (Capps 367). Instead, she becomes a homemaker and then a stay-at-home mother, and the only thing of her own the film shows her pursuing is art. Her descent is aptly described in the New York Times review of the film, which describes her as "the underwritten role of a woman who starts out as a math groupie and soon finds herself the helpmeet of a disturbed,



difficult man” (“Math to Madness”). Radzinski even went as far as to state that Alicia’s purpose in the film, minus her obvious importance to the real-life story, is “to make the eccentricities and antisocial behavior of Nash more palpable for the audience” (Radzinski 47). Essentially, Radzinski argued that her purpose was to make John Nash look better. The issue here is not an image of a woman working at home or Alicia following her passion for art; no, the problem is that the film never shows her completing her degree or she and John discussing future career prospects. The issue is that her purpose centers around supporting John. This makes it appear that her staying at home while John works is a foregone conclusion. It reinforces beliefs that women do not belong in math and are better off pursuing non-STEM activities like art. Additionally, Alicia never makes any suggestions to John to help him with his work nor does he ever talk to her about it in the film, further suggesting that she possesses lesser mathematical abilities and cannot participate in math due to her gender.

*Good Will Hunting* contributes more of the same stereotypes present in *A Beautiful Mind*. Despite clearly being intelligent herself given that she attends Harvard and has been accepted to Stanford for medical school, Skylar repeatedly expresses her amazement at Will’s intellectual abilities. In one instance while she studies during a date with Will, Will offers to give her the answers to her work. After telling him that she has to learn it herself, she asks him how his mind works. He responds by saying, “I dunno. I just kinda remember, ya know?” This instance emphasizes the idea that Will’s brain is not something that can be understood – it is something that can only be marveled at. The fact that Skylar even asks this question shows how impressed she is by Will. It places Will at a higher intellectual level than Skylar, one that she will never be able to achieve. That, as well, is the crux of the issue within this representation. The film positions Skylar in such a way that she will always be lesser than Will, and that clearly bothers Skylar here. Like Alicia Nash in *A Beautiful Mind*, Skylar exists to support the development of

the lead male character, which Richard Rees suggests in his 1999 article “*Good Will Hunting* or Wild Goose Chase? Masculinities and the Myth of Class Mobility”: “Throughout the film, the character of Skylar serves as a barometer of the effectiveness of Will’s psychotherapy” (Rees 232). Rees’s comments argue that Skylar’s personal pursuits are trivialized in favor of attributing greater importance to how her relationship with Hunting makes him appear. This idea that a woman’s presence in the film is limited to supporting the lead male character is a damaging one, as it is not hard to imagine the film subtly suggesting that this is the way it should be in real life.

The differences in supporting characters’ intellectual closeness and separation from the protagonists’ intellects represent the idea that women need extra help from men to advance in mathematics, while men can succeed by themselves. Admittedly, *A Beautiful Mind* tells a real-life story with varying levels of dramatization. This limits its ability to tell a story that completely rejects mathematical stereotypes. However, the directors’ intentional decision to omit the process behind Alicia leaving math still displays differences in how supporting characters relate to leading protagonists based on their gender simply through the way in which they are shown in the film. Essentially, the flaws do not lie in the recantation of true events; they lie in how those true events are shown – or not shown at all. Meanwhile, *Good Will Hunting* as a purely fictional movie is unrestricted by real-life stories, thus making the representations of gender within it the result of entirely unobstructed directorial decisions.

### **From Following to Resistance and Reconfiguration**

Understanding how films follow and reinforce gender stereotypes is essential in the process of formulating solutions. In *A Beautiful Mind* and *Good Will Hunting*, the separation of math from their characters, portrayal of natural brilliance, insistence on independence, disconnect from real life, and questionable romances all fulfill traditional shortcomings of math-related film. If a boy Teen Talk Barbie existed at this time, these films suggest it would be saying

things like “Math is easy!” and “I need to work alone!” For the members of the AAUW, these films likely weren’t encouraging signs that the world was heeding their condemnations and warnings. However, films such as *Mean Girls* and *Hidden Figures* were on the horizon, seeking to resist and reconfigure the standard gender tropes at play in *A Beautiful Mind* and *Good Will Hunting*.

Starting in a world where an international company felt comfortable releasing Teen Talk Barbie a decade or two before, both *Mean Girls* and *Hidden Figures* faced an uphill battle. Simply existing as math-related films with women protagonists set them up as such. Yet, both of them put forth tremendous efforts to resist and reconfigure the stereotypes limiting women’s involvement in mathematics, efforts that should be emulated as the struggle for equality in math continues. I’ll aim to cover the key components of what these films accomplished. Before beginning, I’d like to define a distinction between resistance and reconfiguration. The way I distinguished resistance and reconfiguration in the films was this: resistance is either explicit or incomplete, while reconfiguration is implicit and complete. By that, I mean that the films actively display resistance as a direct response to an unjust problem, or they partially reject a stereotype but don’t fully do away with it. Reconfiguration, meanwhile, is done by ignoring the stereotypical scripts entirely. Instead, it presents resisting ideas as so natural that the viewer doesn’t think twice about them, standing in complete opposition to harmful mathematical stereotypes. This is the crux of how we should proceed: by making it seem right that women should participate equally in math, because it is. This reconfiguration can also help us closer reflect the realities of math, which helps not only women but men, too.

I do want to note here that while total reconfiguration would be ideal, resistance is absolutely essential to achieving it. Yes, reconfiguration is the end goal, but we live in a non-ideal world, making resistance equally important. For example, more of *Hidden Figures* acts as

resistance compared to the greater amount of reconfiguration in *Mean Girls*. By saying this, I am not in any way suggesting *Hidden Figures* was not an important, powerful film. Instead, I'm saying that it was designed to illuminate three women's resistance to the unjust racial and gender expectations during the 1960's, which The New York Times review of the movie alludes to: "*Hidden Figures* effectively conveys the poisonous normalcy of white supremacy, and the main characters' determination to pursue their ambitions in spite of it and to live normal lives in its shadow" ("Who Helped NASA Soar"). *Mean Girls*, on the other hand, is not restricted to aligning with historical accuracy, nor is it restricted to a 1960's setting. It thus has the freedom to address modern stereotypes from more progressive angles.

### **Leading Women Proudly Standing Out**

In *Hidden Figures*, the protagonists' main form of resistance comes in repeatedly asserting they belong as members of the mathematical community. This can be seen in Katherine Johnson's first interaction with Jim Johnson, a colonel who develops into her love interest throughout the film. When she tells him she works for NASA, he responds by saying, "Aeronautics. Pretty heady stuff. They let women handle that kind of – Well. That's not what I mean" (36:00). After Katherine asks him what he means, he says, "I was just surprised something so...taxing" (36:00). Katherine cuts him off again and lists off her credentials, validating why she can work for NASA. Here, Jim is surprised by Katherine's capabilities because she is a woman. Additionally, this scene reflects a common reality for women in mathematics today: forced to validate their position in advanced math at every turn. The fact that Katherine needed to defend her right to do challenging work emphasizes the extra battles women face to simply participate in math. This representation, especially in the mid-20<sup>th</sup> century context of *Hidden Figures*, displays the real belief that women could not both work and fulfill their stereotypical duties in the home. Professors Adria McCardy and Jonathan Matusitz reference this

in their 2021 article “Power in *Hidden Figures*: A Critical Discourse Analysis”: “In the early 1960s, women were still generally expected to take occupations such as secretaries and not more ‘advanced areas’ like science” (McCardy and Matusitz 9). Despite this, Johnson stands up for herself and refuses to be dismissed simply because of her gender.

Mary Jackson’s relentless pursuit of higher education is another example of resistance through standing out in *Hidden Figures*. In the film, Jackson is not allowed to become an engineer because she hasn’t taken the right classes. However, she is also not allowed to take those classes because she is a Black woman. This leads her to fight for the right to take classes alongside white men, producing some of the most empowering one-liners the film has to offer. Her journey begins with a conversation with Karl Zielinski, the movie’s fictionalized version of real-life wind tunnel expert and aeronautics engineer Kazimierz Czarnecki (Loff). When he implores Jackson to take a spot in his Engineer Training Program, she tells him it is impossible for her to do as a Black woman. After saying that he did it even though he is a Polish Jew who was imprisoned in a Nazi prison camp, he asks Jackson, “If you were a white male, would you wish to be an engineer?” She promptly responds, “I wouldn’t have to. I’d already be one” (15:40). Here, Jackson makes it abundantly clear that the only thing preventing her from becoming an engineer is the unjust laws that deny her education. Her intelligence and ability are not a concern. After this interaction, Jackson sets her sights on paving her own path. She appeals to the courts, studying previous cases for hours to formulate her argument. She wins the case and goes to attend her first night class at an all-white high school. She enters the room mid-class, where the film does a fantastic job establishing the intimidating nature of the situation. It sets the tone with a low angle shot of the class looking up at her followed by a high angle shot of her looking down at the all-white, middle-aged male class. The camera pans over to the teacher, who, upon Jackson telling him she is enrolled, says, “Well, the curriculum is not designed for

teaching a woman.” To this, Jackson responds, “Well I imagine it’s the same as teaching a man” (1:31:10). This emphasizes the ridiculousness of the laws denying women access to the class. The scene as a whole also puts Jackson’s bravery and resistance on full display.

The most common example of resistance throughout *Hidden Figures* is also its most basic and most important one: the simple fact that the women stand out from every other character in the mathematical environments. The film repeatedly includes examples of this, especially commenting on this effect with the different ways Katherine Johnson is shot and dressed throughout. The first time Johnson walks into the Space Task Group office, the room immediately gets silent as the men stare at her as she walks to her desk and sits down. To emphasize the differences between Johnson and everyone else in the room, she is dressed in dark clothing, while the rest of them wear nearly the exact same outfit of white shirts, black ties, and dark slacks. For the remainder of the film, anytime the Space Task Group appears in a wide shot, Johnson is immediately recognizable not just because she is the only Black woman, but also because of the director’s intentional choice to dress her character in darker colors. This happens at least four times. The film continues to use wide shots to highlight how Johnson stands out each of the four times she is shown running across the NASA campus to use the restroom. It is easy to identify Johnson in these shots because she is the only one running. While films generally use wide shots to show landscapes or other scenarios where details are hard to pick out, the use of wide shots here, where Johnson stands out so much, emphasizes the sense that she does not belong in her current environment. This, in turn, displays her courage in resisting societal expectations for her while almost everyone else roots for her to fail.

When considering *Hidden Figures*, it is important to also point out the relevance of the women’s Black identities. It is impossible to analyze their resistance to gender norms without mentioning their rejection of racial discrimination in the same breath. This made their actions

doubly challenging, which Sociologist Kera Jones Allen aptly described in her 2017 review of the film: “The West Area women felt they had to prove themselves more capable than their white women counterparts and the male engineers with whom they worked just to gain access to many of the segregated spaces” (Allen 70). The women in this film not only faced an uphill battle against math’s preference toward men, but they also had to struggle against math’s preference toward white people, too. Cady Heron, *Mean Girls*’s protagonist, never faces any setbacks due to her race, and that film contains problematic racial representations in its own right. This makes acknowledging and applauding Johnson, Vaughn, and Jackson’s battles against both gender and racial stereotypes all the more essential.

Before moving on to how *Hidden Figures* and *Mean Girls* reconfigure stereotypical gender roles in math, it would be an oversight to ignore an important act of resistance in *Good Will Hunting*. Although the film as a whole predominately follows and reinforces social norms, Skylar’s intelligence and ambition acts as its main redeeming quality. From the first moment Skylar appears on screen, she is zeroed in on achieving her goal of acing her classes and attending medical school. Repeatedly she is shown working on schoolwork while she and Will spend time together, particularly when the film displays her studying organic chemistry in her dorm room and at an outdoor cafe during a date with Will. Then, at the end of the film, she leaves Boston to attend medical school at Stanford, just like she planned to do all movie long. The film does an excellent job sequencing events here, as this comes after Will tells her he doesn’t love her and breaks up with her. This ensures that Skylar at no point appears selfish for her decision. This action rejects the idea that women should follow a man’s career, and the movie does it so well that it reconfigures perceptions of whether women should prioritize their careers. However, its placement within a movie where Will and his work vastly overshadow

Skylar's accomplishments makes Skylar's independence resist gender norms rather than reconfigure them. Context is key.

### **Collaboration as Resistance**

On top of the strong individual dynamic present in *Hidden Figures* and one part of *Good Will Hunting*, *Hidden Figures* and *Mean Girls* depict another form of resistance in their representation of collaboration. To start, *Hidden Figures* shows the workspaces for the members of the space task group as sets of desks pushed together in pods of up to four people. There are no dividers between them, and nobody has an office other than Al Harrison, the fictional representation of Space Task Group Head Robert Gilruth (Loff). They frequently meet at the chalkboards around the room to discuss their work throughout the film, as viewers see when both Johnson and another mathematician, Paul Stafford, present at various times. Outside of the Space Task Group, the workspaces for the Black women computers led by Dorothy Vaughn are similarly oriented to encourage collaboration. Furthermore, when Vaughn learns how to code the IBM Machine, she teaches the other Black computers how to code it, as well.

Amid this on-screen collaboration, however, the film makes it clear that teamwork was intended only for the white men working at NASA. The protagonists had to assert themselves as worthy members of different groups. When Vaughn is asked to help with getting the IBM machine to work, she refuses the position unless the rest of the Black women computers get to join her on the team. When her demand is accepted, the film cuts to a low angle, straight-on wide shot of the women's legs as they walk down the hall. This represents the women as a collaborative group, and Vaughn's actions reflect their end goal of seeing each other succeed.

Although Johnson's ideas and hard work eventually gain her the respect of many of the men in the Space Task Group, she still faces barriers to getting written credit for her work. This especially arises when she interacts with Stafford, whose character is meant to represent the



other white men Johnson worked with while at NASA (Loff). He repeatedly refuses to list her as a co-author on write-ups of their work, despite the fact that her ideas were instrumental in achieving the end result. This reflects a shared experience for many women throughout history: having men take credit for their work. Some of these include scientist Rosalind Franklin, who discovered the structure of DNA, physicist Chien-Shiung Wu, whose experiments helped disprove the law of conservation of parity, and astrophysicist Jocelyn Bell Burnell, who discovered pulsars. In each case, men either did not credit or claimed entire responsibility for the women's work while winning a Nobel Prize (Nolan).

Even with these moments of challenge in the film, *Hidden Figures* overall shows that, in a crucial moment involving national security, mathematics suddenly becomes collaborative. It's amazing to see what can happen when everyone focuses on finding a solution, rather than fixating on being the hero who came up with a brilliant idea all on their own. It only makes sense, too, that the U.S. put their greatest minds in a room together in a time of crisis, rather than having them work separately. Depicting collaboration was an intentional choice made by the film's director, and it shows the events much more realistically than those that transpire in *A Beautiful Mind*. It is much truer to the ideal mathematical experience in the real world, particularly as it relates mathematical employment.

*Mean Girls* also resists the traditional view of math as an individual pursuit. For one, some of the mathematics shown in the film centers around Heron pretending to need tutoring from her love interest, Aaron Samuels. Though the motivation for this collaboration isn't necessarily ideal for resisting gender roles, the response to Heron asking Samuels for help is. When she inquires about needing some additional support, Samuels quickly and unquestioningly accepts her request. This shows that working together on math is not unheard of nor is it taboo. Furthermore, a later scene displays Samuels legitimately trying to help Heron with her

homework while they are at his house. And although they ultimately kiss later in the scene (which Samuels stops because he thinks it is unfair to his ex-girlfriend, Regina George), the fact that they started with math and that Samuels breaks off their kiss rules out the idea that he so willingly said yes to her request because he was romantically interested in her. Instead, it shows he was genuinely interested in working with her on math.

Another area of collaboration presents itself in *Mean Girls* in the form of the math team, which Heron is encouraged to join by her math teacher Sharon Norbury. For starters, simply placing the word “team” after math immediately makes that group appear as one that does math together. However, this group’s relationship with another goes beyond preparing for their competitions. They are a social group, albeit one that is supposedly outcast from the rest of the student body. As both George and Heron’s friend Damian tell her, joining the mathletes is “social suicide.” While both characters say this, the film doesn’t emphasize it all that much. The mathletes aren’t excluded from any activities, and pretty much every other clique shown in the film is just about as exclusive and “weird” as they are. Even the team captain Kevin Gnapoor is seen as more of an annoyance than someone to avoid interacting with at all costs. All of this plays into the movie’s goal of exaggerating real-life high school social dynamics for the purpose of highlighting how ridiculous they can be.

The film finally reveals its true colors near the end, when Ms. Norbury forces Heron to join the math team for their state competition as punishment for Heron’s involvement in crafting the “burn book,” which insulted pretty much everyone in the school. Gnapoor expresses excitement at Heron joining the team, and no member of the team expresses any reservations at a girl working with them. When they win the state tournament due to Heron’s heroic sudden death answer, they celebrate together. There’s none of Nash’s jealousy or Hunting’s reclusiveness in this scene. After they leave the competition, they arrive at the Spring Fling dance as a group,

each wearing their team jackets and donning their state championship medals. A medium shot from behind them as they walk in displays “Mathlete” written on the back of each of their jackets, providing some nice symmetry that emphasizes their togetherness.

While the collaboration in *Mean Girls* does resist the idea of math as a solo journey, it doesn’t provide a complete reconfiguration. First, the math team doesn’t seem like an attractive option for groups to join. Each member fits the mold of stereotypically awkward and quintessentially uncool mathematicians. Second, the entire team is male before Heron joins them. Though this does show her breaking barriers, it also implies that high school mathematics is a male-dominated arena. Third, Gnappoor trash talks the opposing team after they win the title, ripping his shirt off and tearing into their intelligence. Even in a competition setting within a movie that exaggerates almost everything, this is a little much, especially as it comes after Heron’s moment of reason when solving the final problem. With all of this in mind, the film as a whole still continuously portrays math as collaborative in multiple contexts, which is more than either *A Beautiful Mind* or *Good Will Hunting* can claim.

Now that we’ve outlined the problem by looking at *A Beautiful Mind* and *Good Will Hunting* and covered some approaches that resist but don’t quite reconfigure mathematical gender stereotypes, let’s look at the representations of gender in *Hidden Figures* and *Mean Girls* that should be used to reshape the perception of gender in math.

### **Making Math Relatable**

One of the most repeated harmful representations in *A Beautiful Mind* and *Good Will Hunting* is that of the naturally brilliant male genius. This is primarily represented through numbers and figures floating around the characters or complete lack of on-screen mathematics. Contrast these scenes emphasizing Nash’s and Hunting’s supposed special abilities with how Katherine Johnson is represented doing math in *Hidden Figures*. When she works on math, the

film consistently shows her writing on something, whether that be a chalkboard or a sheet of paper at her desk. She writes math that viewers can see contributes to the problem, instead of unintelligible mathematical symbols floating around her. Her moment of mathematical genius, when she suggests they apply Euler's method to the problem, comes after numerous scenes depicting her working on the problem. The movie mixes occurrences in her daily life between these scenes, clearly indicating an interrupted passage of time. Everything she does involving math more closely resembles the experiences of mathematicians in real life – something that one works at for hours, days, weeks, months, even years, to reach a solution.

This difference in presenting men's versus women's mathematical abilities in these films also appears in one of the oldest film tactics used to implicitly communicate meaning: a character's positioning on screen in relation to other objects. In *Hidden Figures*, Johnson writes her work on chalkboards with her positioned in the foreground and the chalkboard in the background. She presents her work while standing in front of those very same chalkboards. Outside of an early sequence of the film, she never appears to have the mathematical floating number superpowers that Nash and Hunting do. Her work is always visible to viewers and characters in the film, whether she is working on it or talking about it. This creates an effect of mathematics as an accessible field, regardless of how advanced it is. Even if viewers can't understand what the numbers and symbols mean, they at least see Johnson's efforts played out on the page or a board.

Heron similarly writes out her work in *Mean Girls*, whether that be taking notes in class or furiously jotting down solutions at the math competition. Her notetaking is particularly important, as this indicates her anticipation that she will need to look back at it later, rather than having it available instantaneously because she read or heard it once. She and the rest of the math teams writing out their work at the math competition offers a similar effect, where it is clear that

they need at least some thought to provide an answer. This takes place before a montage of the teams going back and forth with speedy answers, which gives the idea that they are thinking before answering each time. A scene earlier in the film showing the math team practicing also adds context for how they can solve problems as quickly as they do. At the end of the competition, Heron faces off against Caroline Krafft, the girl on the opposing school's team (more on her later). After Krafft answers incorrectly, Heron just has to get the question right to win the championship. While she tries to think of an answer, the scene cuts to a flashback of Heron in math class during the unit the competition question relates to. She struggles to think of what is on the board at first, as Samuel's face obstructs her view in the foreground. However, his face eventually disappears, leaving Heron with her now-famous answer: "The limit does not exist!" (1:25:30). This particular moment accurately represents how mathematicians often feel: trying to jog their memory to put the pieces together. It's also a feeling most people can relate to. On top of all this, this scene makes the point that in this intense moment, it's not the boy Heron needs, it's the knowledge written on the board behind him.

In both films, the women's work is tangible. The viewer can literally see how they produced their answers. Furthermore, this doesn't diminish Johnson's intelligence, especially as her solutions are proven right again and again. It shows that even the mathematicians at a prestigious organization like NASA still need to write things down to process their thoughts. Heron, meanwhile, is depicted as a student who is good at math, not outstanding at it. The film shows her taking notes and struggling to recall previous information. If the analysis of these two films is combined, it creates a linear jump for viewers where Heron's devotion to write down her work in high school translates into Johnson solving problems at NASA. There's a path to follow, and it's all the more important that the path is paved by women. The film doesn't bring dramatic attention to these details, and no character ever questions another for their choice to write things

out. It's simply presented as a normal part of the mathematical process – reconfiguration at its finest.

### **Reconfiguring Through Desirability**

While displaying tangible mathematical work and logical thinking act as reconfiguring tactics in both *Hidden Figures* and *Mean Girls*, so does the romantic desirability of their protagonists. Stereotypically, intellect is often seen as a negative trait for women, supposedly making them appear less attractive and desirable (Mendick et al. 20). This again harkens to the “social suicide” status non-mathlete characters attribute to joining the math team in *Mean Girls*. Both films, however, reconfigure this idea, as the leading women's romantic desirability is at the very least unaffected by their intelligence. In most cases, their desirability increases as their love interests learn more about it.

*Hidden Figures* repeatedly shows its protagonists as desirable, as both Jackson and Vaughan are shown as married in the film. The most prominent example of this, however, is the budding relationship and eventual marriage of Katherine and U.S. Colonel Jim Johnson. Although Jim doubts Katherine's ability when they first meet, their relationship becomes quite pleasant after this point, with the New York Times review of the movie saying, “The sweetest subplot involves the romance between Katherine, a widow with three daughters, and a handsome military officer played by Mahershala Ali” (“Who Helped NASA Soar”). Furthermore, the fact that Jim is not a mathematician or engineer displays that Katherine is attractive outside of a mathematical context. This is the case for Jackson and Vaughan's spouses, too. Yes, these relationships on screen do result from historically accurate, real-life relationships that the film had no responsibility for creating. However, the amount of screen time these relationships receive, particularly Katherine and Jim's, is notable in establishing mathematical women as

desirable. These relationships also do not detract from the women's intelligence or take away from the film fully exposing their talents.

*Mean Girls* asserts that mathematical intelligence is attractive even more explicitly than *Hidden Figures*. For most of the film, viewers watch as Heron conceals her mathematical side in an attempt to appear more attractive to Samuels. This stems from Heron's real friends, Janis and Damian, and her so-called "friends," the Plastics, telling her that enjoying and participating in math will completely destroy her social capital. Heron naively believes them, thinking that she is more attractive with the less math ability she displays. However, Samuels becomes less and less interested in her as she strays further from the studious person she was at the beginning of the film. Most characters in the film share in this sentiment, which comes to the forefront at Heron's lowest point in the film, when she reveals herself as the author of the "burn book."

After bearing the brunt of the Burn Book fallout, Heron makes the intentional decision to return to her "true self." Is it cheesy? Absolutely. Does that detract from the point the film is trying to make? I don't think so, especially in the context of a movie that fully commits to its cheesiness. In the film's climactic sequence, Heron goes straight from winning the state math competition to the Spring Fling dance. She is elected Spring Fling queen, much to her surprise and many of the others in the crowd. She wears her math team jacket as she steps up to the stage to accept her nomination, rejecting societal norms for what women are expected to wear at dances. Heron never contemplates removing it, either. After delivering a heartfelt speech apologizing for her actions and vowing to do better, the dance continues. She makes her way over to Samuels, who genuinely congratulates her on winning state, to which Heron unabashedly describes the final problem's content. After some more banter, they finally kiss, disproving that Heron's idea that involving herself in math would make her less attractive. Here, the movie finally breaks from its ironic and sarcastic tone to say that Heron's intelligence doesn't hinder

her romantic desirability; it actually heightens it. Remember, too, that Samuels stopped kissing her when she pretended to need him as a tutor. Here, however, Heron fully accepts her mathematical self, still wearing her math team jacket as they embrace. It's clear that Samuels likes her much more like this, and, most importantly, Heron likes herself more, too.

With all of this, the women's paths toward positive romantic relationships weren't entirely perfect. Jim doubts Katherine the first time they meet, and Samuels calls Heron a nerd when she scores highly on her first math test after the Burn Book fiasco. In each of these circumstances, the films make the critical point that every step toward reconfiguration requires some amount of resistance. It's just a matter of how far these movies are willing to progress to promote equality and better representations. It's important to note that none of this is to say that these women need to be romantically engaged for personal validation, either. Instead, these films show their relationships as things they legitimately desire, and their mathematical intelligence helps them in that process.

### **Displaying Daily Life**

A third example of how *Hidden Figures* and *Mean Girls* reconfigure representations of gender lies in their lead characters' participation in daily life. This stands in direct contrast to films like *A Beautiful Mind* and *Good Will Hunting*, where daily life is largely ignored or deemphasized to make more room for their mathematical ventures. The women characters in the *Hidden Figures* and *Mean Girls* – Katherine Johnson, Dorothy Vaughn, Mary Jackson, and Cady Heron – lead pretty standard lives outside of their time spent doing math. A specific scene in *Hidden Figures* represents this particularly well. In this scene, the three leading women attend a Sunday church service with their children. They gracefully accept praise from the pastor when he highlights their work at NASA, and they all eat with their families at the luncheon following the service. Vaughn and Jackson hype Johnson up to talk with the colonel, and all three of them are



depicted caring for their children in different ways throughout the scene. This clearly shows that all three of them have lives outside of math and people that matter more to them than their work. This representation was intentionally crafted by the creators of the film, with producer Elizabeth Gabler saying, ““We don’t want the math to be over people’s heads or the movie to be like a math class, so it’s accessible and about the people”” in a 2017 interview with Cambell University Dean of Engineering Jenna Carpenter for her article “*Hidden Figures* Light Up Screen: Black Women Who Helped America Win the Space Race” (Carpenter 21). This is a rare occurrence for any sort of interaction with the field of math, where the math itself often matters more than the people behind it.

Heron also aligns with the reality shown in *Mean Girls* when not working on math, even with that reality occurring in the setting of an early 2000s teen movie. She talks and acts like a normal teenager, and the film spends lots of time on her developing relationships with her new friends. She goes to the mall; she goes to parties. She has interests outside of math, and the movie spends time on them. She struggles to fit into her new school and ends up involving herself with the wrong group of people in the Plastics. These are all very realistic, believable situations for a typical human being to be in, and mathematicians fall under that “typical human being” category more often than *A Beautiful Mind* and *Good Will Hunting* may make it seem. The crux of the point here is that managing both life and math are equally challenging for Heron, unlike the two films with men leads where the “life” part of the math-life equation takes a backseat.

### **Supporting Characters Miss the Mark**

Although most of *Hidden Figures* and *Mean Girls* either resist or reconfigure math’s gender stereotypes, there are still a couple of parts where they fall short. It’s essential to note these to emphasize places of potential improvement in the future. A first flaw appears in *Hidden*

*Figures*, which can be found in the representations of supporting characters' relationships and interactions with the leading protagonists. Films often portray supporting women as awed by lead men's intelligence, while they show supporting men as equal to lead women or instrumental to their success (Mendick et al. 20). The character of Al Harrison in *Hidden Figures* is one example of a male supporting character who is instrumental to a leading women's success. Before meeting Harrison, the head of the Space Task Group, two different white women warn Johnson that he has high expectations for those who work for him. One says, "Not many computers last more than a few days. He's been through a dozen in a few months." (16:00), and the other says, "Mr. Harrison won't warm up to you; don't expect it." (17:20). Even before meeting him, this forcibly shows that she must impress a man to find her place. When she does eventually meet him, he immediately asks her a complicated mathematical question, which she correctly answers. In doing so, she gains his respect, which helps her later in the film.

Even as Harrison warms up to Johnson, even to the point of publicly defending her, he is still key to providing her with opportunities. Professor of African American and African Studies Tiyi Morris labels him as the film's "white savior" because of this in her 2018 article "(Un)Learning Hollywood's Civil Rights Movement: A Scholar's Critique." After Johnson angrily exclaims that she has to walk across the NASA campus to use the colored restrooms each day, Harrison knocks a large metal sign denoting a restroom as white only from the wall in one of the most impactful scenes of the film. This allows Johnson to use a restroom near where the Space Task Group works. While it appears like Harrison is doing a good and moral thing, Morris reveals that the scene was manufactured for the sake of the film – it never happened in real life. In regard to this, Morris says, "And while having Harrison knock down the colored sign makes for a dramatic scene and heartwarming storyline, it also undermines Johnson's agency" (Morris

417). Here, the film represents her as needing Harrison's help, when in real life she simply broke the rule and used the white restrooms without any assistance from Harrison.

This same idea comes up later on as Harrison vouches for her to take part in meetings at the Pentagon about the work she has been doing. This again results from Johnson standing up for herself, yet the film still depicts her as needing Harrison's help. The best example of Harrison's essentiality to Johnson's success occurs in a scene that is otherwise her most mathematically powerful moment in the film. After she makes a key breakthrough near the end of the movie, she stands presenting her work while the rest of the white men in the Space Task Group sit listening. This is the first time in the movie where she is shot in a way that places her above the rest of the group. As she describes the problem they face, she pauses for a moment, stuck. Harrison makes a small suggestion, which is the key to prompting Johnson's thoughts on how to continue. For mathematicians, a small suggestion that leads to a breakthrough is often the most important part of a problem – everything else is easy as it all falls into place. Because of this, the person who made the suggestion often gets a lot of the credit. Thus, Harrison here is shown as the one who “solves” the problem, even if he isn't the one who completes the final solution. Morris suggests that the eventual result of these scenes is that “perhaps subconsciously, they normalize Black women's marginalization and lack of agency while promoting white men's heroism” (Morris 418). This creates the exact opposite effect the film's producers likely intended, all because of the dramatized contributions of a supporting character.

While Harrison is a fairly significant character throughout much of *Hidden Figures*, a character that appears just once is the one that falls short in *Mean Girls*. At the state math competition, the two teams end in tie, resulting in each getting to choose a member of the opposing team to answer a sudden death tiebreaker. Though both schools select the girl on the opposing team, the film makes it clear that they were wrong to assume they were bad at math

because of their gender when Heron correctly answers the tiebreaker. Instead, it's the portrayal of the girl Heron's team chooses to represent the other school that is problematic. After Heron and the other girl, Caroline Krafft, are selected, they step up to microphones placed in the middle of the floor. During this, the movie depicts Krafft walking in slow motion, with Heron saying in a voiceover, "Miss Caroline Krafft seriously needed to pluck her eyebrows. Her outfit looked like it was picked out by a blind Sunday school teacher. And she had some 99-cent lip gloss on her snaggle tooth ..." (1:24:30). The film uses close up shots of Krafft's face to emphasize her supposed ugliness. For a film that works so hard to break down gender norms in math, this moment is heartbreaking. In a lot of ways, it completely undermines the films' reconfiguration toward women being able to be both intelligent and romantically desirable. Even as Heron acknowledges that making fun of Krafft won't help her win the competition, this doesn't do anything to dismiss the film's choice to establish Krafft as what a woman mathematician is like. It seriously damages the movie's reconfiguring basis, especially reconfiguring toward women being represented as both mathematically intelligent and romantically desirable.

### **The Effects of Comparison**

For much of this paper, I've evaluated each film separately, seeking to select and analyze key components of each. Now, though, I'm going to evaluate them in comparison to each other. These films do not exist in a vacuum; viewers of *Hidden Figures* can watch *Good Will Hunting*, too. The differences they find between them likely go a long way in crafting their perception of different gender's experience in math. With this, it's important to ask why – what is the reason for the difference in male and female representation? Hollywood writers are not secretly conspiring to unequally represent mathematical characters. Instead, I think that directors, unintentionally or not, feel the need to validate women's participation in mathematical settings throughout the films. I can't blame them too much, either; *Hidden Figures* depicts a true story,

and that story is the unjust treatment of three Black women working to partake in roles they should have been in with their talent and credentials years before. However, doing so in a way that is true to history while dramatizing and exalting John Nash's story in *A Beautiful Mind* creates a different narrative. This dichotomy arises in fictional representations, too. *Mean Girls* highlights Heron's struggle to pursue math despite the loss in social capital it may cause, while Will Hunting comfortably flaunts his natural ability in *Good Will Hunting*. All of this evidence points toward a clear representation of a perceived difference in men's and women's mathematical abilities.

To start, consider the way Johnson's mathematical capabilities are portrayed in comparison to the other mathematicians around her. By the time she earns her way to placement on Space Task Group, she doesn't appear to possess more ability than the men she works with – at least not in the same way Will Hunting and John Nash effortlessly outshine peers and superiors. Instead, she is mostly represented as possessing a greater work ethic. When she presents her idea for safely moving the space capsule from an elliptic to a parabolic orbit that impresses and shocks the rest of the room, it is preceded by multiple scenes of her working through the problem first. Even if she may be naturally smarter than the rest of the mathematicians in the room, the movie does not present it as such.

The stakes are admittedly lower in *Mean Girls* than in the other films – she is not working at NASA, Princeton, or MIT, after all – but the representation of her mathematical capability is still problematic, even in comparison to the other movies. Her mathematical abilities are less than those of some of the other characters in the film, which is something that *Hidden Figures* did not do, nor did, predictably, *A Beautiful Mind* or *Good Will Hunting*. Yet, this film shows other members of the math team as possessing greater mathematical intellect than her, particularly as she only answers a single question at the math competition at the end of the

movie. While this makes sense in reality, as the members of the math team clearly practiced more often and prepared specifically for solving mathematical problems quickly, that has not stopped movies like *A Beautiful Mind* and *Good Will Hunting* from extending beyond what would likely occur in real life.

From these examples, it is evident that films represent “natural” mathematic capabilities differently for men and women. John Nash, Will Hunting, and Katherine Johnson may all exist on a similar level of mathematical knowledge – the fact that they are the lead characters of mathematical films certainly suggests so. However, Nash and Hunting are portrayed as genius men, while Johnson is shown as a hardworking woman. It’s nearly impossible to compare *Mean Girls* to these films simply because of the vast gap in the level of mathematics, but the film certainly portrays her math ability as a result of hard work rather than natural talent, similar to – although not exactly the same as – Johnson. This dichotomy is found in a multitude of other popular films with “smart” protagonists: genius men are represented in Tony Stark from *Iron Man*, Ramanujan from *The Man Who Knew Infinity*, and Robert Oppenheimer in *Oppenheimer*, and hardworking women are represented in Amy and Bernadette from *The Big Bang Theory* and Catherine from *Proof*. These stereotypical representations come from commonplace beliefs that men are naturally better than women at math. This places a ceiling on how far women can advance in math, as evidenced in Mendick and her co-researchers' study: “While all participants felt that most people, through effort and/or good teaching could improve at mathematics, this was combined with the idea that your ‘natural’ ability set limits on how far you could improve and that this was needed to be a ‘real’ mathematician” (Mendick et al. 32). This thus explains why male mathematician characters are portrayed at a different level of genius in comparison to their peers than female mathematician characters in similar scenarios.

### **A Difference in Belonging**

Beyond the difference in men's and women's intelligence in comparison to their peers, the films with male protagonists differ from those with female leads in the ways in which they implicitly suggest who does or doesn't belong in math. For example, the plots of both *A Beautiful Mind* and *Good Will Hunting* center more on the protagonists' internal struggles rather than on the math they produce. Meanwhile, *Hidden Figures* contains none of this content, instead spending most of its runtime on the mathematical actions of the lead characters. And although *Mean Girls* also doesn't display Heron doing much math in the film, she also says she is rusty during the math competition, implying that she has lost some of her knowledge because she hasn't been practicing. The subtle commentary emerging from this is that films must validate women mathematician's capabilities on screen, while viewers will simply accept that men mathematicians are talented with little to no work shown on screen.

Let's dive into *Mean Girls* and *Good Will Hunting* a little further, given that both are fully fictional and are thus unrestrained by attempting to stay true to history. While it takes Heron a full movie of perseverance and self-exploration to find her place in math, Hunting's entrance into the world of mathematics is almost a foregone conclusion. With both of these films, it's important to note the difference between comfort and belonging. Yes, there is no doubt Hunting is uncomfortable in academic contexts. But there is also no doubt that he belongs there. The message given to him throughout the film, no matter how frequently he rejects it, is "You belong, you belong, you belong." It's not shown as dramatically as the scene where Hunting and Maguire throw escalating repetitions of "It's not your fault" back and forth at each other, but it's there. The audience is rooting for it, his counselor is rooting for it, heck, his friend famously tells him the best part of his day is walking up to Hunting's house hoping that he's left to reach his full potential. Meanwhile, the message consistently given to Heron throughout *Mean Girls* is the exact opposite: "You shouldn't belong, you shouldn't belong, you shouldn't belong." There's no

epic scene where those close to her settle their differences to push her to follow her dreams; in fact, the popular opinion is that her decision is about the most unpopular thing she could've done. This gives the idea that men simply have to be good at math to belong to the mathematical community, while women must fit their entire selves into the idea of what a stereotypical mathematician is. Even then, women might not entirely fit the bill because they are not men. Essentially, popular representations of women in math often depict them as needing to act and perform perfectly to belong in the mathematical community.

Unsurprisingly, the representation of perceived differences in popular films has negative consequences. People understandably follow along with what is represented in popular media regardless of if their following is conscious or not, just as Colatrella suggests in her book. Additionally, even if gendered representations of natural mathematical ability are excluded, representations that show math as something one needs to be a genius or naturally gifted to understand is disproportionately harmful for women, as found in Mendick and her team's research: "While these ideas about 'natural' ability affect both male and female learners of mathematics, our research suggests that they have greater impact on girls and women" (Mendick et al. 32). Because women are already stereotypically excluded from participating in math, additional discouragement via representations of unattainable genius mathematicians only adds fuel to the fire. In this case, the negative effects of differing, sexist representations of men and women and math intersects with the negative effects of displaying mathematicians as naturally brilliant, compounding the problem at hand.

### **Returning to the Real World**

For those who believe that math movies have to portray their lead characters like Nash and Hunting, the data disagrees. On top of their potential positive impacts on attracting women to mathematics instead of excluding them, math films that more closely parallel reality do just as



well or better than other movies that glorify male mathematical protagonists. While *Good Will Hunting* and *A Beautiful Mind* earned \$225.9 million (439.6) and \$316.8 million (558.7) at the box office, respectively, *Hidden Figures* raked in \$236.2 million (301). It is important to acknowledge that those numbers convert to \$439.6 million, \$558.7 million, and \$301 million in 2024-adjusted dollars for *Good Will Hunting*, *A Beautiful Mind*, and *Hidden Figures*, respectively, according to measuringworth.com. This does broaden the gap a little. However, the awards scene is much closer. *Good Will Hunting* won 24 awards and garnered 61 nominations, and *A Beautiful Mind* won 37 awards of its 69 nominations. Meanwhile, *Hidden Figures* claimed 37 awards among its 94 nominations, according to IMDB data. *Mean Girls* is different from the other three films in that it wasn't designed to be an award-winning film, yet it still has claimed a huge place in pop culture and has a cult-like following. This data is included here not to incite competition between the films, but instead to prove that films with women mathematician protagonists that better align with reality find similar financial success and similar or greater critical notoriety. And if both the money and critics agree, there's not much room for disagreement.

Each point so far culminates in a final assessment: men mathematician characters are idealized, while women mathematician characters reflect reality. When you stop and think about it, the male representations don't make sense. Ideas are more likely the result of a team (the idea of the individual might come from mathematical concepts being named after the person who developed it). Difficult solutions are the result of time on task, not spur-of-the-moment revelations. People become more of an expert as they age. Social awkwardness and mistreatment of others doesn't make someone romantically desirable. The male characters exist in a perfect world for them, where they can commit endless hours to math, are revered by those around them, and are romantically desirable without having to put forth significant effort in their relationships.

They often benefit from scripts that favor them, as illustrated in this comment from the New York Times review of *A Beautiful Mind*: "... anything that would dilute our sympathy by acquainting us with the vicissitudes of Mr. Nash's real life has been airbrushed away, leaving a portrait of a shy, lovable genius" ("Math to Madness"). Women characters, meanwhile, exist in an imperfect world – the real one.

Based on the analysis of each of these four films, it appears that the solution to these harmful representations of gender is simple: produce more films with women mathematician protagonists with a natural, unexplainable ability to do mathematics. Indeed, the lack of naturally genius women protagonists makes it seem as though women are not naturally good at math. However, there's one major flaw with that logic: it doesn't help. A 2016 study conducted by researchers at Ohio State University found that women's assimilation to the lead character, or their feelings of how similar they are to the protagonist, is more important than simply the presence of a women mathematician character. The researchers argued that "The fact that the positive effect of exposure on performance is contingent upon assimilation for women who think they are bad at math emphasizes the importance of relatable, self-relevant female role models in counterstereotypical, traditionally male domains ..." (Luong and Knobloch-Westerwick 2019). So, instead of making more films portraying the Katherine Johnsons of math as genius John Nashes, math media would foster more positive results if it produced more movies portraying women like Katherine Johnson and tempering the heroic genius archetype present in *A Beautiful Mind* and *Good Will Hunting*.

Reconfiguring math media will take a significant effort. It will require reducing how much emphasis math movies place on natural brilliance and replacing it with more examples of how real mathematical work inspires people to come up with ingenious ideas. This can be done by displaying characters actively working on a problem on screen. *Hidden Figures* proved that

it's not as boring as it might seem. It will require depicting mathematicians participating in daily activities, with other essential parts of life like family and friends taking up some of the screen time. This will work to support the idea that a person can both be a mathematician and have a strong familial and social life. Plenty of mathematicians have families, and plenty of them have interests that fall outside of math. Just ask them. Adding to this, it will require showing mathematical women as both intelligent and romantically desirable. The two are not exclusive to one another. This would be helped by removing questionable relationships like those in *A Beautiful Mind* and *Good Will Hunting*, ones where it seems like the male mathematician can do anything and still receive romantic love. And of course, it will require continued resistance, showing women proudly standing their ground and claiming their rightful place in math. Even small steps like the mathematical collaboration in *Hidden Figures* and *Mean Girls* or Skylar as a positive figure in *Good Will Hunting* are useful. They are steps in the right direction, nonetheless. Ideally, we reach a world where gender representation in mathematics is as balanced as possible. At the conclusion of the Ohio State researcher's study, they said, "As long as stereotypes undermine women's academic and intellectual performance, society misses out on potential contributions of half of the population—a crying shame" (Luong and Knobloch-Westerwick 210). Failure to progress is accepting that Teen Talk Barbie was right, over thirty years later. It tells girls and women interested in math that they can't do it, or that they must sacrifice pieces of themselves to fit in. Instead, we should focus on breaking down math's gendered norms that rob women of a chance to be themselves and succeed. We should aim to reach a point where those harmful norms are just like the solution to Heron's state championship-winning solution: DNE. Does not exist.

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