FILM

MARGUERITE'S THEOREM (LE THÉORÈME DE MARGUERITE)

directed by Anna Novion. Icarus Films, Brooklyn, NY, U.S.A., 2024. 115 minutes, color, French / English subtitles. Distributor's website: https://icarusfilms.com/di-mtheor.

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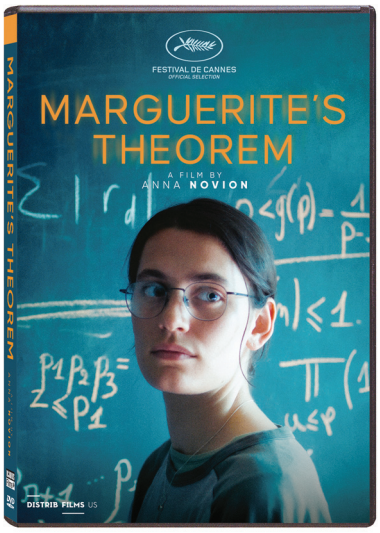
On 7 June 1742, the Prussian mathematician Christian Goldbach wrote a letter to Leonhard Euler in which he proposed what is now known as the Goldbach Conjecture. It remains one of the oldest and best-known unsolved problems in number theory and all of mathematics. The conjecture states that every even natural number greater than 2 is the sum of two prime numbers, and this has been shown to hold for all integers less than 4×10^{18}. Despite considerable effort, however, Goldbach's Conjecture remains unproven.



Marguerite's Theorem uses this complicated and unsolved problem as its foundation. The plot unfolds around Marguerite Hoffman's (played by Ella Rumpf) obsession with finding a solution. She is sidetracked when a mistake in her thesis presentation at France's top university, the Ecole Normale Supérieure (ENS), alters the trajectory of her life. We are initially introduced to her in the film's opening sequence as she is sitting for an interview with a reporter of the school's student paper. Nervous, and wearing her comfortable bedroom slippers during the interview, she explains she will be presenting her work to specialists for the first time shortly thereafter. This Marguerite seems wispy, frail, and nerdy. One strength of the film is how Rumpf convincingly develops her, adding some measure of strength and maturity to Marguerite as the film develops.

Once the error enters the picture, we begin to perceive how unsupportive her advisor, Laurent Werner (Jean-Pierre Darroussin), is. He reacts by telling her she should start a new thesis with someone else, despite telling her before the presentation that elite female mathematicians are rare, and she must grab the spotlight. His change of heart encapsulates the degree to which he is effectively portrayed as the kind of academic who sees graduate students as tools for advancing their own career. A short exchange later in the film summarizes how ambitious and manipulative a person he is. Marguerite tells him, "Truth is, you used me for your research, and when I didn't fulfill your expectations, you tossed me away like I'm worthless." To which he responds, "See, you take it far too personally."

Instead of finding another advisor, Marguerite leaves school, promising she will repay her scholarship. Many seemingly improbable yet plausible adventures follow. Among them, an unsuccessful job training session leads her to the charismatic and fun-loving Noa (Sonia Bonny), a dancer who becomes her roommate. Another is her teaching herself mahjong, joining illicit games, and using her winnings to cover the rent.

It is mahjong that eventually leads her back to the conjecture. In a particularly powerful sequence, she perceives a winning set of tiles as a math equation. The strength of this sequence is that we recognize she has gleaned a path toward solving the

conjecture, and the cinematography captures her insight into the complex mathematics without bogging the film down with an explanation of them. Rather, it reminds us that cinematic storytelling doesn't require the audience to understand the math behind the thoughts involved in the visualization. The film moves along seamlessly because we comprehend the excitement she feels upon glimpsing a new path forward.

Marguerite turns to Lucas Savelli (Julien Frison) to help her flesh out her new perspective on solving the conjecture, despite her earlier dislike of him. He had transferred from Oxford to work with Werner. After Marguerite and Lucas build a solid working relationship, they inevitably fall in love. Lucas's personality serves as a reminder that mathematicians, like all of us, are varied. He is a saxophone player who is comfortable mingling socially. In other words, he shares Marguerite's passion for math but does not have the kind of singular focus that defines her.

As their relationship develops, we learn more about Marguerite's background and perceive how her singular focus took form. Her father left her mother when she was nine. One outcome was that, as a child suffering from insomnia, she thought about infinity quite a bit. The idea that the universe had no end led her to read all the math books in the library. She explains that it was math that led to her desire to solve tangible problems, problems that had solutions. This in turn drew her to the complexity and challenge of Goldbach's unsolved pyramid problem, with its infinity of prime numbers. She knew she would spend her life trying to solve it. "Goldbach was a way of putting order into infinity."

Two features of the film stand out. One is that, at the end, it is strikingly more of a love story than a film about math. The second is that Marguerite is present in just about every sequence of the film, and Ella Rumpf pulls this off splendidly. Watching the timid young graduate student develop her strength and identity is a part of how the film charms the viewer. In other words, early in the film, we meet a character who is only focused on math. At the end, she has grown up and fallen in love. Some of this is captured when she tells her mother that she thinks she has met someone important: "It's strange. I think about him more than math." In effect, her mother gives her permission, saying, "Even if it ended badly with your dad, I've never forgotten how happy I was with him."

There is no formula for treating advanced mathematics in a film. Some films have equated it with mental illness, as was the case with *A Beautiful Mind* (2001), the biopic on Nobel Prize winner John Nash. Sometimes, it is coupled with autism: for example, in *Good Will Hunting* (1997), a film in which a young janitor at MIT solves a near-impossible math equation. Will attracts the attention of an esteemed mathematician, goes through therapy, and he, too, falls in love. *Hidden Figures* (2016) brought to light the contribution of three female African American mathematicians: Katherine Goble Johnson (Taraji P. Henson), Dorothy Vaughan (Octavia Spencer), and Mary Jackson (Janelle Monáe). They worked at NASA during the Space Race as trajectory calculators and some of the first computer programmers, and, like the personalities in this film, they demonstrated that mathematicians are not unique. The *Hidden Figures* women placed real stories of people good at math within the larger social fabric.

Marguerite's Theorem goes on the mathematics film list as a tender film that works due to the fine acting, the musical underscoring, and how the cinematography presents the story to us. What is fascinating throughout is that the film often moves along with the abstract languages of music and mathematics complementing one another. Probably closest to *Marguerite's Theorem* is Dan Clifton's short *The Calculus of Love* [1], in which he presents a mathematics professor obsessed with solving the conjecture. When a series of mystery letters arrives hinting at a solution, Bowers believes his lifelong dream may at last be within reach. The hope, and the film, literally goes up in flames when we see one of his female students burn her work, which she claims shows the path to the solution. As it turns out, she was the daughter of a mathematician he had seduced years earlier during his quest to solve the problem.

I was impressed with how the film's musical underscoring set the tone in sections without dialogue, particularly at the end when Marguerite is driving from her mother's house to share her latest insights with Lucas at a conference he is attending. The editing and framing work effectively, too. For example, in the math conference that ends the film, the cross-cut sequences show Lucas and Marguerite entering an initially empty room so she can show him her work. We also see that Werner is at the conference. Another part of the mix shows that her spontaneous presentation to Lucas quickly draws a crowd, and within this, the emphasis is placed on her presentation using out-of-focus shots of the crowd. When she finishes showing Lucas her ideas, all the mathematicians break into applause, with Werner hesitantly joining in and adding, "She's my student." Unsurprisingly, he wants to share the credit. By contrast, Lucas departs and leaves her with all the mathematicians in the room, now asking questions. Rather than taking them, Marguerite chases after Lucas. She tells him she loves him, and they embrace. All in all, and despite this quintessential riding off into the sunset quality, the film's tender temper, cinematic elements, and the acting hit the right notes. Given all the challenges surrounding us in these trying times, I am appreciative and enthusiastic about this movie, particularly its final optimistic note.

Reference

1 *The Calculus of Love*, 2011, https://vimeo.com/288855976.