Spring Section Meeting at Montgomery College

The Spring 2022 Meeting of the MD-DC-VA section of the MAA will be held at Montgomery College on April 22-23, 2022.

Friday: The Friday workshop will be run by MD-DC-VA COMMIT and will feature Dr. Rebecca Segal discussing *Building Interdisciplinary Partnerships to Create Application-Focused Mathematics Content, A SUMMIT-P Project*. The banquet address will be given by Sam Ferguson on *Back in the Saddle: Cutting through Clutter with Analytic Combinatorics*.

Saturday: The morning address, *Applying Formal Methods to Safety-Critical Systems*, will be given by J. Tanner Slagel from NASA. The Saturday afternoon address, *Cosh, Cosh, B-Cosh*, will be given by Alex Meadows of St. Mary’s College of Maryland.

See pages 4–6 for more information.
JOHN M. SMITH DISTINGUISHED TEACHING AWARD

Congratulations to Daniel Showalter of Eastern Mennonite University, the 2021 recipient!

Nominations for the 2022 MAA Section Awards for Distinguished College or University Teaching of Mathematics are now being accepted. The Award Selection Committee will determine the recipient of the John M. Smith Teaching Award and the awardee will be honored at the Spring 2022 Sectional meeting and will be widely recognized and acknowledged within the Section. The awardee will also be the official Section nominee for the 2022 MAA Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics.

Anyone may make a nomination, but nominations from chairs or MAA liaisons in departments of mathematical sciences are especially solicited. An outline of the nomination process can be found on the website: http://sections.maa.org/mddeva/smith_award.php.

SISTER HELEN CHRISTENSEN SERVICE AWARD

Congratulations to Leigh Lansford, Phillip Poplin, & David Shoenthal of Longwood University, the 2020 recipients!

The Sister Helen Christensen Service Award is given each fall for outstanding service to the profession. The award is given at the MD-DC-VA Fall Sectional meeting and comes with a certificate and citation published in MAA on-line, the section website and the MD-DC-VA section newsletter. The award is named after Sister Helen Christensen, in honor of her lifetime of service to mathematics education and the section.

SECTION REPRESENTATIVE’S REPORT

As I write this final report as representative for the Maryland-DC-Virginia Section I must confess to mixed feelings. I have enjoyed my tenure in the position and learned a lot about the MAA over the past three years, but I’ve also discovered that there’s still a lot I don’t know. Perhaps that’s the greatest thing about this job, you learn and it makes you want to learn more. One unfortunate fact about my tenure, however, is that most of it has occurred during the pandemic. Only my first Congress meeting was in person, and I must admit my fondest memories are from that meeting.

There are some people who love working in a virtual environment, but I think it’s less effective when you’re meeting with a fairly large group. In that first meeting I was able to talk easily with people at my table, and meet other people from different MAA sections during breaks and lunch. Online breakout rooms just don’t give you that same ease of communication. When you’re in a room with people you hear their voices, but you also see their body language, which is a crucial part of communication.

So, here’s to hoping that the pandemic fades and our next sectional representative mostly gets to attend in-person meetings.

That brings us to MathFest 2022 https://www.maa.org/meetings/mathfest which is currently being planned as a “triumphant return to a full in-person meeting” in Philadelphia, PA, August 3-6, 2022. Registration is now open, and there will still be a virtual component for those who are unable to attend in person, or prefer to attend remotely.

Also, I encourage everyone to support our Program Chair, Ryan Shifler, by suggesting speakers for our meetings. In particular, make sure you check out all the opportunities for great speakers.

Below I have provided information on three MAA programs offering assistance in obtaining guest speakers for our Section meetings. I have provided the specific links for each program.

Section Lecture Series:

The MAA has expanded its Section Lecturer Series to three programs. The George Polya Lecturer program (MAA Polya) has been joined by two new programs: MAA AWM, in partnership with the Association for Women in Mathematics (AWM) and MAA NAM, in partnership with the National Association of Mathematicians (NAM). The three programs are being made available to MAA Sections on a three-year rotation that started with this (2021-2022) academic year. The Maryland-DC-Virginia Section will be eligible to select an MAA NAM speaker next year.

It is customary for Sections to waive the registration, banquet, and any social fees of the speaker, but the lecturer will pay their own travel expenses and be reimbursed by the MAA. For more details and information on the available speakers please see https://www.maa.org/member-communities/maa-sections/section-programs/lecture-series.
Section Visitors Program:
MAA leadership will visit your section and speak with section members. See https://www.maa.org/member-communities/maa-sections/section-programs/section-visitors-program.

Editor Lectures Program:

Finally, I hope to see many of you at our Spring Section Meeting at the Germantown campus of Montgomery College, April 22-23, 2022.

I’ve enjoyed serving you as Section Representative for the past three years and I look forward to seeing and working with many of you in the future.

Best wishes for your continued health and safety!

Bonita V. Saunders
MD-DC-VA Section Representative
bonita.saunders@nist.gov

NEWS FROM THE SECTION

Robert Kennedy, a teacher at River Hill High School in the Howard County Public School System, won a two-year grant from the NSA to expand his student math journal work. The goal of the journals is to motivate students to write about mathematics beyond the school curriculum and for students to read about mathematics beyond the curriculum.

In 2015 Robert started a math journal at Centennial High School, and Centennial students have successfully published a journal each year since. The students’ journals are available as pdfs at http://chsmathjournal.weebly.com/online-journal.html

Robert is now working with students at Centennial, and River Hill to produce school specific math journals, as well as a group of students from the remaining 10 high schools to publish a countywide math journal. The ultimate goal is for each high school to produce its own math journal and for the county to publish a “best of” journal.

If any professional mathematician would like to contribute an article or suggest topics for investigation Robert and his students would be greatly appreciative. Feel free to contact Robert at robert_kennedy@hcpss.org
This workshop will showcase the collaborative process of creating class activities at Virginia Commonwealth University (VCU) with partner discipline input, allowing Differential Equation students to interact with mathematical content in an application focused format. VCU is part of SUMMIT-P: A National Consortium for Synergistic Undergraduate Mathematics via Multi-institutional Interdisciplinary Teaching Partnerships that is an extension of work begun in the Curriculum Renewal Across the First Two Years (CRAFTY) project. Along with sample activities, we will discuss how faculty conversations between departments can enrich the mathematics curriculum and lead to stronger student engagement.

**Dr. Rebecca Segal** is a Professor and Interim Chair in the Department of Mathematics and Applied Mathematics at Virginia Commonwealth University. Her mathematics research is in differential equation models of disease processes and biological systems and she works collaboratively with faculty across the campus and around the United States. She earned her PhD at North Carolina State University, completed a postdoctoral fellowship at CIIT Centers for Health Research, and was a teaching fellow at University of Bristol, England. She is PI on two NSF grants focused on undergraduate and graduate mathematics education and training.

**MD-DC-VA COMMIT:** The MD-DC-VA COMMIT was formed in early 2016 (the group was originally called the MD-DC-VA IBL Consortium) as a network of college math instructors with a common interest in teaching and learning using inquiry. We recognize that teaching with inquiry can look very different in different contexts, and view our role as supporting instructors in utilizing the version that works for them and their students. Names that have been used for teaching with inquiry include: ambitious teaching, project-based learning, complex instruction, inquiry-oriented learning, discovery learning, inquiry-based learning, and student-centered teaching. We welcome members who are new to teaching with inquiry as well as those who are more experienced. Please join us!

**COMPUTER GRAPHICS**

There is a surprising amount of mathematics in computer graphics. For instance, in a technique called ray tracing, what is used for animated movies and visual effects. The technique is essentially integrating a function of four, sometimes more, variables. Because of the high dimensionality of the problem, the standard method for evaluating this integral is the Monte Carlo method. In the picture to the right we can see how the rendering changes as more random samples are taken. With few samples, there is considerable noise, which disappears as more samples are used.
When sailors fall overboard in a storm, their lives depend on searchers’ abilities to find them before it is too late. Their positions must be tracked until they can be picked up by other vessels. But the tracking instruments are so sensitive that they yield many “false alarms” or, as we call them, “clutter” measurements. The task of finding the targets’ most likely positions gets bogged down by the clutter due to a combinatorial explosion in the number of assignments of measurements to targets. Rather than rely on too-slow enumerative methods, we introduce two ideas from analytic combinatorics in the context of amusing examples involving Stirling’s approximation of \( n! \) and the Fibonacci numbers. Combining these ideas, we get a new “saddle point” approximation of the positions’ likelihoods that delivers sufficiently accurate estimates without the slowdown of traditional probabilistic methods.

Sam Ferguson is a Research Scientist at Metron Inc. in Reston, Virginia. Metron researchers are known for finding the sunken treasure ship SS Central America, finding the lost Air France Flight 447, their ongoing project to find the lost cities of gold in South America, and developing software the Coast Guard uses to find sailors lost at sea—all with the math of probability theory. Ferguson is also an Adjunct Professor at George Mason University in Fairfax, Virginia, and a Professorial Lecturer at George Washington University in DC. A popular speaker at seminars and math department colloquia, his articles have been published in Notices of the AMS, Communications in Pure and Applied Mathematics, and The American Mathematical Monthly, among others. In 2019, he received his PhD from NYU’s Courant Institute and the inaugural NExT teaching grant from the MAA’s Metro New York section. His use of mathematical analysis to resolve divergence issues in IRS guidance was recognized with a film clip and article in Money in 2018. The son of an archaeologist, he looks forward to active participation in our MAA section when he’s not out hunting for lost treasures amidst the ruins of ancient civilizations.

In addition to the rendering step, there is significant math used in the physical movement of the models. Here is an example of a numerical method known as the Material Point Method used to model the movement of hair and it’s interaction with other objects. For instance realistically modeling how snow would react when thrown on hair. Or representing how the hair behaves when braided or twisted on itself.

How do you know a proof is correct? Traditionally, mathematical proofs are socially verified – at least one human, following a set of implicit rules of natural language and logic, determines if the proof is believable. If the proof becomes overly tedious and/or is essential to some safety- or mission-critical application, it becomes necessary to determine the soundness to a higher standard.

'Formal methods' refer to mathematically rigorous techniques and tools that enable specification, design, and verification of hardware and software systems. The specification used in formal methods are statements in a mathematical logic while the formal verifications are deductions in that logic. Formal methods can be difficult or time/resource intensive, but offer a higher level of assurance than standard verification through testing or handwritten proofs.

This talk will introduce formal methods, motivated by applications of interest to NASA, including uncrewed aircraft operations in the national airspace, urban air environments, and wildfire areas. The audience will be given a crash course in mechanically verified proofs in the Prototype Verification System (PVS), an interactive theorem prover. Numerous examples will be given to show the usefulness of PVS in assurance of safety-critical systems.

J. Tanner Slagel has been a Research Computer Scientist at NASA Langley Research Center since 2019. He applies and develops formal methods tools to safety- and mission-critical avionics systems. Before working at NASA, Tanner completed his Ph.D. in massive inverse problems at Virginia Tech. In Tanner’s free time, he enjoys Matrix perturbation theory and walking his dog, Rupert.

Saturday Afternoon Address

COSH, COSH, B-COSH

The hyperbolic cosine function (cosh) is well known for many reasons, both analytic and geometric. In this talk, we start with a not often celebrated property, that the area under any portion of the graph of cosh is equal to the graph’s length. We will explore playful generalizations of this property, by changing our perspective. What if we measure length on the graph differently, say using the length inspired by taxicabs? Beginning from basic ideas of calculus, our investigation of generalized cosh functions and related curves will lead us to some advanced ideas in analysis and geometry, with a few surprises along the way. This talk is based on joint work with Casey Douglas from the University of Houston and Beth Thomas, current grad student at VCU.

Alex Meadows has been teaching at St. Mary’s College of Maryland since 2005 and is currently chair of the department of Mathematics and Computer Science. He now teaches courses in both Math and CS. Originally trained as an analyst, he also works in geometry and combinatorial game theory, involving many undergraduate students in the joy of thinking about mathematics.
NEWS FROM AROUND THE SECTION

◊ The UVA math department will be hosting an REU this summer specializing in number theory.

◊ A lecture series by Mikhail Khovanov as well as a conference on Categorical Methods in Representation Theory and Quantum Topology will be held at UVA this spring.

◊ Dr. Ken Ono, chair of the UVA math department has been working with the UVA swim team, including Olympic medalists and world record holders.

◊ Dr. Lugosi at Montgomery College was a guest editor of a special issue of the International Journal of Mathematical Education in Science and Technology titled *Takeaways from teaching through a global pandemic – practical examples of lasting value in tertiary mathematics education.* All papers and the editorial are available at [https://www.tandfonline.com/toc/tmes20/53/3](https://www.tandfonline.com/toc/tmes20/53/3).

◊ Ray Cheng, an Associate Professor of Mathematics at Old Dominion University, has been promoted to Captain (O-3) in the U.S. Air Force Auxiliary (Civil Air Patrol). In this volunteer role, he takes part in search and rescue, disaster relief, and other humanitarian missions.

◊ Bonita Saunders, Research Mathematician, National Institute of Standards & Technology, has been appointed Group Leader of the Mathematical Software Group in the Applied and Computational Mathematics Division. She assumed the duties of the new position on January 2, 2022.

SECTION CHAIR’S REPORT

Hello MD-DC-VA Section!

Hope you all are well and enjoying math everyday 😊

I’d like to begin with a thank you to everyone for their flexibility and patience as we had to change the spring meeting dates and location due to the rescheduling of JMM. Unfortunately, JMM was moved to the dates we had planned to have our spring meeting at Virginia State University (VSU). I would like to thank VSU for their willingness to host us and for the work they had already put in to make this happen. The new dates and location for the spring meeting are April 22-23 at Montgomery College (MC) in Germantown, MD. I’d like to thank MC for being available to work with us on short notice and those Section Officers and others who also contributed to the planning of this meeting on short notice.

Despite meeting in person at MC, we will be holding elections for new Section Officers online as we did last spring. The ballot will come out soon from the national office. While we have the usual positions to fill for this year (Chair Elect, New Faculty Coordinator, At-Large Member, and Webmaster) we will also be electing a new Director of Member Communications since Emily Meehan will be leaving the section, and a new Program Chair (we accidentally left this off the ballot last spring). The nominees put forth by the nominating committee are:

- Chair Elect: Jason Rosenhouse
- Program Chair: Ryan Shifler
- New Faculty Coordinator: Jill Tysse
- At-Large Member: Kristen Boyle
- Director of Member Communications: Amy Vennos
- Webmaster: Brian Heinold

Thank you to Ryan and Brian who volunteered for another term and to our outgoing officers, Past Chair Minah Oh, Section Representative Bonita Saunders, Director of Member Communications Emily Meehan, New Faculty Coordinator Jathan Austin, and At-Large Member Kevin Sinclair. And congratulations to Maggie Rahmoeller, our new Section Representative! She was elected earlier this semester through an online ballot from the national office.

I look forward to seeing everyone at the spring Section meeting. If you can’t make the spring meeting, I hope to see you at the fall meeting: November 4-5 at Shenandoah University.

Cheers!

Kathryn

MAA MD-DC-VA Section Chairperson
SONYA KOVALEVSKY PROGRAM AT MONTGOMERY COLLEGE

A generous grant from AFCEA Bethesda enabled Montgomery College to continue the Sonya Kovalevsky Program. The program consists of year-round science, technology, engineering, and math (STEM) oriented activities for Montgomery County 6th grade students. The program is part of Montgomery College’s commitment to increase the number of women pursuing sciences and mathematics at the post-secondary level. The shortage of students pursuing STEM careers is well documented, but the shortage of female students is even more alarming. Women are underrepresented in STEM post-secondary education programs of study and professions. The participants of the program were selected from MCPS. Priority registration opportunity was given to students from Title I schools. The students who were waitlisted for the November event were given the opportunity to register for the winter cohort.

This is the second year that the program was conducted virtually through Zoom. For Sonya Kovalevsky Day on November 6th, 53 students participated. SK Day incorporated chemistry and physics related activities. The day started with a brief introduction about the program and welcome address. Then the students attended two virtual science shows presented by Mad Science of Washington. The show ‘Things That Go Boom’ included experiments revealing four signs of a chemical reaction through foaming and color changing experiments, balloon inflation, and explosions. The show ‘Fire and Ice’ included foggy dry ice clouds and the chemistry of fire. Students also learned about the science of magic, including a disappearing water trick and fun with air pressure. We also had a Kahoot activity about women scientists, which was led by two MC student volunteers. The presenters did an amazing job engaging the participants during the activities.

The 2022 Winter Cohort consisted of 22 sixth grade students from Montgomery County Public Schools. The three-day cohort program was conducted over three consecutive Saturdays (Feb 5, Feb 12, and Feb 19). Ms. Julia Brodsky had three sessions of interactive lessons titled ‘Astrobiology - The Search for Life in Space,’ which focused on exciting cutting-edge science. The students learned about the ice-covered moons of Jupiter and Saturn that can host habitable oceans, Kepler and James Webb telescopes, role in the search for exoplanets, and planetary habitability concepts. On the second day The National Museum of Mathematics (MoMath) led a virtual field trip – ‘Crazy Dice’, where students learned about probability. The Mad Science of Washington presented two shows ‘Fire and Ice’ and ‘Things That Go Boom’ on the first and last Saturdays. The SK Program is a remarkable opportunity for the young students to engage in many different areas of STEM.

Jigsaw Sudoku — Laura Taalman

Rules: Fill in the grid so that the numbers 1 through 9 appear exactly once in each row, column and jigsaw region.

To see the solution, go to page 7.

Save the Date

Join us for Mathfest, the annual summer meeting of the MAA, August 3-6 2022 in Philadelphia, PA.

The annual summertime meeting features numerous sessions devoted to all aspects of mathematical education and the latest in mathematical re-
A friendly reminder about a great classroom resource: Convergence is the MAA’s free online journal about the history of mathematics and its use in teaching. Aimed at teachers of mathematics at both the secondary and collegiate levels, Convergence covers many topics from grades 8-16 mathematics: algebra, combinatorics, synthetic and analytic geometry, trigonometry, probability and statistics, elementary functions, calculus, differential equations, and linear algebra.

From one-minute warm-ups to classroom projects using primary sources, there are many interesting and fun resources on the Convergence website:

- **On This Day**: (Main page, on the right side of the screen.) Three or four historic mathematical events that happened on each date. There is also a Quotation for the Day.
- **Problems from another time**: Math problems from throughout mathematics history, as well as articles that include problem sets for students.
- **Hundreds of articles**, searchable by topic (algebra, fractal geometry, statistics), type (activity, demonstration, problem set, project), and format (Maple, spreadsheet, JavaScript). Or you can use these **searching tips**. There are also indices of **article series**, **award-winning articles**, and **translations**. Our own MD-DC-VA Section member Adrian Rice recently published an article on **Helping Ada Lovelace with her Homework**.

- **Reviews** of new and old books, websites, and other teaching aids that focus on utility in the classroom.
- A **calendar** of meetings and events involving the History of Mathematics.

- And lots more: **Mathematical Treasures**, a **Portrait Gallery**, ...

You can become involved in Convergence in several ways:

Use teaching tools such as one of our projects in your classroom and **tell us about your experiences**. Develop teaching tools and modules for your classroom based on articles in Convergence and **share them with us**.

Write an **article**!

Become a *Convergence* referee. Please **contact** *Convergence* editors Amy Ackerberg-Hastings and Janet Heine Barnett to let them know what topics and types of articles you would prefer to review.

Section members Adrian Rice and Betty Mayfield – and co-editor Amy Ackerberg-Hastings -- are currently serving on the Convergence editorial board and would be happy to answer questions.
Montgomery College, which is a two-year college in the Washington, D.C. area, has been working to grow its data science program and outreach to students and industries in the community. We have created and/or are working on creating a number of new programs and initiatives including:

1. a new A.S. in Data Science that is awaiting approval from MHEC
2. an Early College in Data Science program
3. a business analytics degree

In addition, AMATYC’s Statistics ANET and Data Science Subcommittee are collaborating to pilot the first-ever DataFest for Community Colleges this April 9-10, 2022. Ultimately, Montgomery College’s goal is to begin to work more broadly with data science faculty at other community colleges across the country to facilitate ways members can help each other establish best practices for 1. recruiting and retaining diverse populations of students in data science 2. developing certificates and degrees, 3. creating transfer agreements to four-year institutions, 4. forging pathways for career opportunities, and 5. increasing connections to local government and industry.

Undergraduate Student Essay Competition

Congratulations to the winner of this year’s undergraduate student essay competition Conor Mahoney from Randolph-Macon College.

“Man I hate Algebra!” Jonny thought to himself as his teacher droned on and on. He was sitting in his Algebra I class waiting for his professor to let them go home. It was his last class of the day and it was his least favorite.

“Why am I even required to learn this? It’s not like I’m ever going to use algebra,” he thought. Finally, after what felt like hours the bell rang and Jonny ran straight to the bus. When he finally reached home, he decided to play video games despite having a lot of math homework to do. He sat down at his computer and loaded up his favorite game, an open world RPG.

“What a great game, maybe I’ll make a game like this someday.” Jonny mumbled under his breath as he admired the beautifully crafted artwork and seamless mechanics woven into the game. Time flew by as he played, effortlessly
spending hours exploring the procedurally generated world. He didn’t notice but his eye lids began to get heavy. Slowly his eye’s slid shut and he fell asleep.

There was something wrong with Jonny’s game.
“What’s wrong with this why won’t the world load?” Jonny said to himself.
“Well, it seems like you broke the procedural generation I’d say.”
Jonny jumped at the unknown voice. “Who said that!?” He exclaimed. He looked all around his room but saw no one.
“Oh, it’s just me” The voice responded. Jonny tried to identify where the voice was coming from and slowly his eyes fell upon his computer. There was a small man on the screen, but he seemed out of place. He wasn’t wearing the games normal fantasy armor or clothes; he was wearing a modern-day suit.

“Who are you?” Jonny asked.
“I’m the man who made this game of course! You can call me David. Anyway, it appears the world generation has stopped working. I wonder why.” Pondered the small digital man.
The man on Jonny’s computer brings up a smaller screen and starts typing. “Huh it seems like all the math has disappeared.” David muses.
“What do you mean math? This is a video game there isn’t supposed to be any math in it!” Jonny said confused. How could math be in a video game? Especially one so fun.

“Of course, there’s math in it!” David responded happily. “How do you think this whole world appeared? I definitely didn’t design every tree or rock! I just made the algorithm that generates it all, and that algorithm relies on math!” David kept working away at his screen typing in numbers and with each line he typed, more and more of the world slowly loaded in.

“But that’s not like algebra math, right? It’s different kind of math.” Jonny asked. His eyebrows furrowed, almost like he feared the answer.

David laughed to himself lightly as he worked. “Sure, it’s not exactly algebra but you do use calculus which needs algebra to work. That’s just for one part of the game too. Almost every aspect of my game and many others like it rely on mathematics. The stats on weapons, enemy AI and transactions in the game all have a basis in math! Even a lot of the architecture was made using geometry! Don’t worry about it though I’ll get it working again by the time you wake up everything will be back to normal. Just don’t forget what we talked about.” David said, winking. His words began to fade off into a soft murmur until eventually Jonny couldn’t hear him at all.

Jonny felt confused and out of place. His vision started getting fuzzy and his head was spinning. Suddenly he eyes shot open. His head was lying on his desk next to his computer and his game was still running. He checked his clock and saw that it was almost midnight. “I’ve got school tomorrow!” This realization put him fully alert, and he sprung out of his seat. Jonny quickly shut off his computer and tried to sleep but he kept thinking about that strange dream he had.

The next morning when he went to class, all he could think about was his algebra class. When it finally came he decided to pay a bit more attention. Afterward he even stayed late and talked to his teacher about what it might take to make a video game.

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TREASURER’S REPORT

General Fund
Balance, October 5, 2021 $5,774.51

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Balance, March 1, 2022 $5,912.41

John G. Milcetich Student Achievement Fund
Balance, October 5, 2021 $975.95

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Balance, March 1, 2022 $1,076.15

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Balance, October 5, 2021 $0.00

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Balance, March 1, 2022 $140.00

Section NExT Fund
Balance, October 5, 2021 $668.75

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Balance, March 1, 2022 $1,062.75

IBL Consortium Fund
Balance, October 5, 2021 $1,754.06

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Balance, March 1, 2022 $1,754.06