

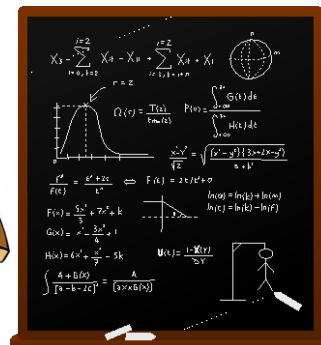
UNDERGRADUATE MATH SEMINAR

This week's seminar is back in its "usual" time slot, Thursday at common lunch.

DATE: **Thursday, February 27**

Time & **12:30 pm** – Pizza and drinks in Bailey 204

Location: **12:50 pm** – Seminar in **Bailey 207**



Hey Junior Math Majors – this one is for you, though all are welcome!

In this seminar, five current senior math majors, **Ryan Baldwin, Meichai Chen, Ziyi Hu, Bridget Logan, and Zach Porat**, along with several math faculty, will present the following seminar:

Title: All about the Senior Writing Experience

Abstract: This seminar will be an info session on how to satisfy the Senior Writing Requirement (WS) in the math department as a math major. There will be a panel of math faculty and students who have experience with senior theses and/or the senior writing seminar (MTH-487); they will be happy to answer questions you may have about the Senior Writing experience.

MCM – An Intense (and fun!) Four-Day Math Contest – by Bridget Logan

Have you ever wondered how much of an impact global warming and the increase of global ocean temperatures might have across the globe? Not only does the rise of ocean temperatures affect marine life, but it can also be detrimental to industries and its employees who rely the stability of ocean-dwelling species to live and flourish in specific areas of the ocean. My partners and I had to consider these factors as we attempted to create a mathematical model to answer a question provided by the Consortium for Mathematics and Its Applications for their Mathematical Contest in Modeling. This contest receives about 10,000 models from across the globe from groups of high school students and undergraduates who challenge themselves to apply their STEM knowledge and other skills to real-world open-ended problems.

We chose from the three available problems to create a model relating to the effects of the rapid increase of global ocean temperatures, specifically in Scottish waters. The problem asked us to create a model that will help explain the issues related to the potential migration of Scottish herring and mackerel. The Scottish fishing industry relies on these fish to reside in a specific area, yet with the increase in ocean temperatures, they will most likely migrate north to colder temperatures, which might be out of range economically for the small fishing companies. We were asked to develop a model to identify the locations of these fish species over the next 50 years. We also needed to predict whether these Scottish companies can economically afford relocating their ports or afford traveling farther out north, closer to where the fish might relocate. Once we received this problem, we had 100 hours to create a model.

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Team 1: Jacob Feinstein, Bridget Logan, Thomas Farina

Team 2: Khoa Ngo The, Son (Kyrie) Nguyen, Ziyi (Dennis) Hu

Team 3: Qiyue (Mary) Zhang, Qinyuan He, Han Yang

To begin, we found data points from NOAA, The National Oceanic and Atmospheric Administration on past and present North Atlantic Ocean temperatures at specific longitude and latitude. Next, to see how the water temperature changes over time, we applied a linear transformation for the next 50 years in 1-year time intervals. Once we found the new temperature points, we calculated the Euclidean distance between the points that have the same temperature from the starting point, since this is the optimal temperature both fish species survive in. We recorded the shortest distance to the nearest temperature, as well as exactly where this specific location was. We repeated that process for each year for the next 50 years and were finally able to compare the changes in latitude and longitude to predict where the fish might end up in 50 years. We concluded that most Scottish herring and mackerel would travel about 20 - 50 miles north of their original locations within the next 50 years, depending on whether the fish can adapt to an increase in temperature or not. With this knowledge, we could then predict how this change would economically impact small Scottish fishing companies. According to the data we found from the Scottish Fisheries Statistics, there is not an immediate threat to these companies in 50 years from now. However, the fish will definitely migrate farther and farther away, and the next 100 years may be an entirely different story if our global ocean temperatures continue to increase at an alarming rate.

It is safe to say that all three of us know way more about Scottish fisheries and fishing vessels than we ever thought we would. At the end of this project, we even considered starting our own fishing company off of the coast of Scotland given the fishing industry there is worth millions of dollars. While we may not win the contest, we could all agree it was an enjoyable experience, and especially rewarding to apply our knowledge and skills to real world issues outside of the classroom.

Reminders: Deadlines and Events

- **Petitioning:** Accept or decline your petitions **Tuesday, February 25 – Thursday, February 27**
- **Teaching Experience for Undergraduates (TEUs):** the deadline for applications for the summer programs in Mathematics, and also in Science, is **Saturday, February 29**. For more information about TEU's, please check out the website, teu.vassar.edu. You can also read about them in the January 27 issue of the math newsletter, available with other back issues of the newsletter, on the math department's website: <https://www.union.edu/mathematics/newsletters>
- **Hudson River Undergraduate Mathematics Conference (HRUMC).** This one-day math conference is **Saturday, April 4 at Mount Holyoke College**.
 - If you are interested in presenting a talk, contact a math faculty member to sponsor it. The deadline for abstract submission is **Friday, March 6**, via the conference website: HRUMC, linkable from the Union Math Department website -> Activities -> HRUMC -> Abstract Submission.
 - If you would simply like to attend this (free!) conference, contact **Professor Paul Friedman** (friedmap@union.edu) by **Friday, March 6**.

Problem of the Newsletter – February 24, 2020

Last week's problem: Congratulations to **Vu Le '23** and **Son Nguyen '23** for solving last week's problem. Vu's solution has been posted at the newsletter sites in Bailey Hall.

This week's problem: It's time for some calculus!

Evaluate

$$\int_0^{\infty} \left(x - \frac{x^3}{2} + \frac{x^5}{2 \cdot 4} - \frac{x^7}{2 \cdot 4 \cdot 6} + \cdots \right) \left(1 + \frac{x^2}{2^2} + \frac{x^4}{2^2 \cdot 4^2} + \frac{x^6}{2^2 \cdot 4^2 \cdot 6^2} + \cdots \right) dx.$$

Hint: Recall the (Maclaurin) series expansion of e^x .

Professor Friedman (friedmap@union.edu) will accept solutions until noon on Friday, February 28.