

Homework Nine

Calculus II

College of the Atlantic

Due Friday, March 10, 2023

There are two parts to this assignment!

Part 1: WeBWorK. Do Homework 09 which you will find the WeBWorK page here: <https://webwork-hosting.runestone.academy/webwork2/coa-feldman-es3012m-winter2023>.

Part 2: Non-WeBWorK problems. Here are some instructions for how to submit this part of the assignment.

- Do the problems by hand using pencil (or pen) and paper. There is no need to type this assignment.
- If you like working on a tablet, go for it.
- Make a pdf scan of your work using genius scan or some similar scanning app. Please make the homework into a single pdf, not multiple pdfs.
- Submit the assignment on google classroom. Please don't email it to me. Thanks.
- If you want, you can do the non-WeBWorK problems in pairs and submit only one assignment for the two of you.

Here are some non-WeBWorK problems.

1. Suppose in an effort to stimulate the economy, Governor Mills gives everyone in Maine \$600. Let's assume that there are one million people in Maine. So the total expense to the state of Maine is 600 million dollars. Of this extra money, assume that people spend 80% of it and save the rest. Thus, the initial boost to the economy, in terms of new spending, is 80% of 600 million dollars, or 480 million.

But this extra spending is now extra income for someone else. Assume that of this extra income, 80% is spent and 20% is saved. This spending then is someone¹ else's extra income, of which 80% is spent and 20% is saved, and so on. Calculate the total additional spending in Maine created by the governor's \$600 payment to all Mainers.

2. Use the ratio test to determine whether or not the following series converges:

$$\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!} \quad (1)$$

Show your steps.

¹We assume that all spending stays in Maine.

3. You and your friend live on the same road, 20 miles from each other. One day you both decide to leave your houses at exactly noon and bike toward each other on the road that connects your houses. You both bike at a constant speed of 10 miles/hour. Your friend has a parrot. The parrot leaves your friend's house at the same time as your friend. She flies down the road at a speed of 15 miles/hour. When the parrot reaches you, she turns around and flies back to your friend. The upon reaching your friend, she turns around and flies to you, and so on. This continues until you and your friend meet, halfway between your houses.
- (a) How far does the parrot fly in the first part of her journey: from your friend's house to you?
 - (b) How far does the parrot fly in the second part of her journey: from you to your friend?
 - (c) How far does the parrot fly in the third part of her journey: from your friend to you?
 - (d) Write the total distance traveled by the parrot as an infinite sum, and then calculate the value of the sum, to figure out the total distance flown by the parrot.
 - (e) Find another, more direct way, to determine how far the parrot has flown. (Hint: At what time do you and your friend meet.)