

Homework Nine

Calculus I

College of the Atlantic

Due Friday, November 11, 2022

Part 1: WeBWorK. Do Homework 08 on WeBWorK. The WeBWorK page is here: <https://webwork.runestone.academy/webwork2/coa-feldman-es1024i-fall>. I recommend doing the WeBWorK part of the homework first. This will enable you to benefit WeBWorK's instant feedback before you do part two.

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.
- 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.

Here are some non-WeBWorK problems.

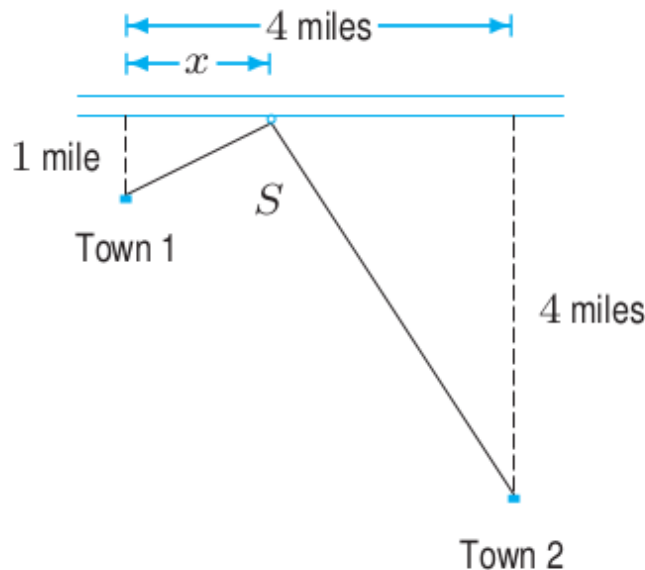
1. You and your friend both traveled to Des Moines, Iowa, for a fun-filled weekend get together. Monday morning comes and you head your separate ways. You drive due north toward Minneapolis at 100 km/hr, and your friend drives due west toward Omaha at 50 km/hr. As you head northward, you think about how much you miss your friend, and you picture them heading west, getting ever farther away from you. You begin to wonder: how fast is the distance between me and my friend growing?
 - (a) How fast is the distance between you and your friend growing after you have each been driving for one hour?
 - (b) How fast is the distance between you and your friend growing after you have each been driving for two hours?

2. It is winter break and you are bored. You decide to pass the time by watching cars drive by on a lonely road near your home. The road happens to run directly east-west. You position yourself 5 meters south of the road.

A car appears in the distance to your right. You watch it as it gets closer and closer to you. It passes directly in front of you and then recedes to the left. Eventually it is so far away that you can no longer see it. This scene repeats itself several times over the next hour. You begin to wonder, how is the speed at which I have to move my head related to how fast the car is going and the position of the car?

Let θ refer to the angle between your line of sight and due east. So if you are looking due east, $\theta = 0$, and if you are looking due north, $\theta = \pi/2$. On this road cars always travel at a constant speed of 60 km/hr.

- (a) You are watching a car. At the moment in time at which $\theta = \pi/3$, at what rate (in radians/sec) must you turn your head so that the car remains in the center of your line of sight?



3. Two towns are located near a straight river, as shown in the figure above. Town 1 is one mile from the river and town 2 is four miles from the river. The two towns both will get drinking water from a single pumping station, whose location is indicated by S on the figure. There will need to be a pipeline from the pumping station to each of the towns. Where should the pumping station be located so the length of the pipeline is minimized?