Miniproject 7: Related Rates

Overview: This miniproject focuses on another important class of applied calculus problems, namely *related rates* problems. These problems augment and extend the kinds of problems you have worked with in WeBWorK and class discussions.

Prerequisites: Section 3.5 of *Active Calculus.*

This miniproject is **not** one of the CORE miniprojects. This miniproject is an elective for those targeting a course grade of A or B.

For this miniproject, select EXACTLY TWO of the following and give complete and correct solutions that abide by the specifications for student work.

Problem 1. A sailboat is sitting at rest near its dock. A rope attached to the bow of the boat is drawn in over a pulley that stands on a post on the end of the dock that is 5 feet higher than the bow. If the rope is being pulled in at a rate of 2 feet per second, how fast is the boat approaching the dock when the length of rope from bow to pulley is 13 feet?

Problem 2. A baseball diamond is a square with sides 90 feet long. Suppose a baseball player is advancing from second to third base at the rate of 24 feet per second, and an umpire is standing on home plate. Let θ be the angle between the third baseline and the line of sight from the umpire to the runner. How fast is θ changing when the runner is 30 feet from third base?

Problem 3. Sand is being dumped off a conveyor belt onto a pile in such a way that the pile forms in the shape of a cone whose radius is always equal to its height. Assuming that the sand is being dumped at a rate of 10 cubic feet per minute, how fast is the height of the pile changing when there are 1000 cubic feet on the pile?

Submission instructions: Please prepare a writeup that includes all your work for two of the above problems. Remember to begin each solution with a clear statement of the problem.

The resulting writeup can be done in whatever fashion you wish but it must be saved as a PDF file and submitted using Blackboard. (You may use any program you want to write the writeup but the submission *must* be a PDF, or your work will be marked at Novice level and returned without comment.)

File name: Please give your PDF file for this miniproject the title:

`LastName Miniproject7.pdf`

where `LastName` is your last name.