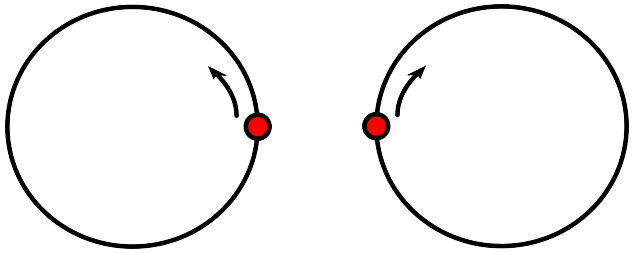
ASSIGNMENT $2 \cdot 10$

There are two parts to this assignment. The first part is on WeBWorK — the link is available on the course webpage. The second part consists of the questions on this page. You are expected to provide full solutions with complete arguments and justifications. You will be graded on the correctness, clarity and elegance of your solutions. Your answers must be typed or very neatly written. They must be stapled, with your name and student number at the top of each page.

1. Two runners are running on circular tracks, where each lap is 1320 feet. The tracks are 100 feet apart at their closest. The runners start opposite each other on the insides of the tracks and run at the same rate of 10 miles per hour (in the directions shown in the figure). How fast are the runners separating when each has run 165 feet?



2. The height of a rectangular box with a square base is increasing at rate of 2 meters per second while the volume is decreasing at a rate of 5 meters per second. At what rate is the side length of the base decreasing, at the moment when the base area is 64 square meters and the height is 8 meters?
3. As part of the Ph.D. graduation requirements, your instructor is required to go on a skydiving trip to prove that he can do related rates problems while free-falling. The graduation committee is observing the event on the edge of a tall cliff situated 28m away from the helicopter from which your instructor will jump. However, the chute fails and he plummets to certain disaster. Amidst the ensuing chaos, your instructor observers that his distance from the chopper (in metres) is given by:

$$s(t) = 5t^2$$

   (a) Solve the related rates problem by finding the rate of change of the distance between your instructor and the observing committee 3 seconds after the jump.

   (b) [Optional] Provide the thrilling conclusion to the story.