

Related Rates Practice Problems

Calculus I, Math 111

Name: _____

1. Suppose a 6 foot tall person is 12 feet away from an 18 foot lamppost. If the person is moving away from the lamppost at a rate of 2 feet per second, at what rate is the length of the shadow changing?

2. An aircraft spotter observes a plane flying at a constant altitude of 4000 feet directly toward her. She notes that when the angle of elevation is $\frac{\pi}{6}$ radians, it is increasing at a rate of 0.1 radians per second. What is the speed of the airplane?

3. A man walks along a straight path at a speed of 4 feet per second. A searchlight is located on the ground 20 feet from the path and is kept focused on the man. At what rate is the searchlight rotating when the man is 15 feet from the point on the path closest to the searchlight?

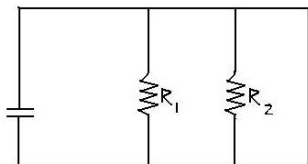
4. A balloon is rising vertically above a level, straight road at a constant rate of 1 foot per second. Just when the balloon is 65 feet above the ground, a bicycle moving at a constant rate of 17 feet per second passes under it. How fast is the distance between the bicycle and balloon increasing 3 seconds later?

5. A dock is 6 feet above water. Suppose you stand on the edge of the dock and pull a rope attached to a boat through a pulley on the dock edge at a constant rate of 2 feet per second. Assume that the boat remains at water level. At what speed is the boat approaching the dock when it is 20 feet from the dock? At what speed is the boat approaching the dock when it is 10 feet from the dock?

6. If two resistors with resistances R_1 and R_2 are connected in parallel, as in the figure, then the total resistance R , measured in ohms (Ω), is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}.$$

If R_1 and R_2 are increasing at rates of $0.3\Omega/s$ and $0.2\Omega/s$, respectively, how fast is R changing when $R_1 = 80\Omega$ and $R_2 = 100\Omega$?



7. A water trough is 10 meters long and a cross-section has the shape of an isosceles trapezoid that is 30 centimeters wide at the bottom, 80 centimeters wide at the top, and has height 50 centimeters. If the trough is being filled with water at the rate of 0.2 meters cubed per minute, how fast is the water level rising when the water is 30 centimeters deep?
8. A baseball diamond has the shape of a square with sides 90 feet long. A player running from second base to third base at a speed of 28 feet per second is 30 feet from third base. At what rate is the player's distance from home plate changing?
9. The minute hand on a watch is 8 millimeters long and the hour hand is 4 millimeters long. How fast is the distance between the tips of the hands changing at one o'clock?