Related Rates Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. If the radius of a balloon is increasing at a constant rate of 0.03 inches per minute, how fast is the volume of the balloon changing at the time when its radius is 5 inches?
2. A woman is watching a plane from the ground through a telescope. The plane is flying at a constant altitude of 7 miles at a speed of 10 miles per minute towards the point directly above her.

At what rate is the angel of her telescope changing at the instant the plane is 24 miles away (as measured horizontally along the ground)?

1. A 13-foot ladder leans against a wall. Gerry tugs at the bottom of the ladder sliding it along the floor away from the wall at a constant rate of 2 feet per second. At what speed is the top of the ladder sliding down the wall at the instant when the bottom is
   1. 5 feet from the wall
   2. 10 feet from the wall
   3. Challenge: Describe the speed of the tip of the ladder as the bottom of the ladder approaches 13 feet.
2. A man, six feet talk, walks away from a 15 foot lamppost at a rate of 2 feet per second.
   1. At what rate does the length of the shadow grow?
   2. What is the speed of the tip of his shadow?
3. An oil spill expands in a circular pattern. Its radius increases at a constant rate of 1 meter/second. What is the rate of change of the area of the spill at time = 1 minute?
4. A particle moves along the curve y=x2 in such a way that its x-coordinate increases at a constant rate of 2 inches per second. What is the rate of change of its distance from the origin when x=5? What is the rate of change of the angle between the x-axis and the line OP where 0 is the location and P is the position of the particle when x=5?
5. The length of a rectangle increases by 3 feet per minute while the width decreases by 2 feet per minute. When the length is 15 feet and the width is 40 feet, what is the rate at which the following changes:
   1. Area
   2. Perimeter
6. The volume of a tree is given by  whereis the circumference of the tree in meters at ground level and *h* is the height of the tree in meters. Both *C* and *h* are functions of time *t* in years.
   1. Find a formula for . What does it represent in practical terms?
   2. Suppose the circumference grows at a rate of 0.2 meters/year and the height grows at a rate of 4 meters/year. How fast is the volume of the tree growing when the circumference is 5 meters and the height is 22 meters?