Name: _____

4.6 Related Rates

1. A rectangle has one side of 10cm. The other side is increasing at a rate of 3cm per minute.

   (a) How fast is the area of the rectangle changing at the instant when the growing side is 12cm?

   (b) How fast the diagonal is changing at the instant when the growing side is 12cm?

2. A dose, D, of a drug causes a temperature change, T, in a patient. For C a positive constant,
$$T = \left(\frac{C}{2} - \frac{D}{3} \right) D^2$$

   Find the rate of change of temperature change with respect to dose.

3. A gas station stands at the intersection of a north-south road and an east-west road. A police car is traveling toward the gas station from the east, chasing a stolen truck that is traveling north away from the gas station. The speed of the police car is 100 mph the moment it is 3 miles from the gas station. At the same time, the truck is 4 miles from the gas station going 80 mph. Is the distance between the car and truck increasing or decreasing? How fast?

4. A searchlight is positioned 10 meters from a sidewalk. A person is walking along the sidewalk at a constant speed of 2 meters per second. The searchlight rotates so that it shines on the person. Find the rate at which the searchlight rotates when the person is 25 meters from the searchlight.

5. A conical tank is being filled with water. The tank has height 4 ft and radius 3 ft. If water is being pumped in at a constant rate of 2 cubic inches per minute, find the rate at which the height of the cone changes when the height is 26 inches. Note the difference in units.

6. A person 5 feet tall is walking toward an 18 foot pole. A light is positioned at the top of the pole. Find the rate at which the length of the person's shadow is changing when the person is 30 feet from the pole and walking at a constant speed of 6 feet per second.