Applications of Derivatives: Related Rates Notes

1. Assume that oil spilled from a ruptured tanker spreads in a circular pattern whose radius increases at a constant rate of 2 ft/sec. How fast is the area of the spill increasing at the instant when the radius of the spill is 60 feet?

2. A police cruiser, approaching a right-angled intersection from the north is chasing a speeding car that has turned the corner and is now moving straight east. When the cruiser is .6 miles north of the intersection and the car is .8 miles to the east, the police determine with radar that the distance between them and the car is increasing at 20 mph. If the cruiser is moving at 60 mph at the instant of measurement, what is the speed of the car?

3. The top of a 25-foot ladder is sliding down a vertical wall at a constant rate of 3 feet per minute. When the top of the ladder is 7 feet from the ground, what is the rate of change of the distance between the bottom of the ladder and the wall?

4. A baseball diamond is a square with sides of 90 feet. A batter hits the ball and runs toward first base with a speed of 24 ft/sec. At what rate is his distance from second base decreasing when he is halfway to first base?

5. A tank of water in the shape of a cone is leaking water at a constant rate of $2\frac{ft^3}{hr}$. The base radius of the tank is 5 ft and the height of the tank is 14 ft.
    a. At what rate is the depth of the water in the tank changing when the depth of the water is 6 ft?

    b. At what rate is the radius of the top of the water in the tank changing when the depth of the water is 6 ft?

6. A trough of water is 8 meters deep and its ends are in the shape of isosceles triangles whose width is 5 meters and height is 2 meters. If water is being pumped in at a constant rate of $6\frac{m^3}{sec}$. At what rate is the height of the water changing when the water has a height of 120 cm?

7. A light is on the top of a 12 ft tall pole and a 5ft 6in tall person is walking away from the pole at a rate of 2 ft/sec.
    a. At what rate is the tip of the shadow moving away from the pole when the person is 25 ft from the pole?

    b. At what rate is the tip of the shadow moving away from the person when the person is 25 ft from the pole?

8. A spot light is on the ground 20 ft away from a wall and a 6 ft tall person is walking towards the wall at a rate 2.5 ft/sec. How fast is the height of the shadow changing when the person is 8 feet from the wall? Is the shadow increasing or decreasing in height at the time?