AP Calculus 2.6 Extra Credit *name*_____*p*___

1. 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 0.6 mi north of the intersection and the car is 0.8 mi 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?

2. A boat is approaching a light tower at 30 mph. The light tower is 100 feet tall and has a spotlight at the top of it to help boats find the pier. Find the rate of the change of the angle of elevation from the boat to the spotlight at the top of the light house when the boat is 1 mile from the pier.

3. The mechanics at Lincoln Automotive are reboring a 6-in deep cylinder to fit a new piston. The machine they are using increases the cylinder's radius one-thousandth of an inch every 3 minutes. How rapidly is the cylinder volume increasing when the bore (diameter) is 3.800 in?

4. Gravel is being poured onto a pile at the rate of 180 cubic meters per minute. The pile is in the shape of an inverted cone whose diameter is always three times its height. Find the rate at which the diameter of the base is increasing when the pile is 6 meters high.

5. An observer stands 150 meters from a fireworks display rocket that is fired directly upward. When the rocket reaches a height of 200 meters, it is traveling at a speed of 12 meters per second. At what rate is the angle of elevation formed with the observer increasing at that instant?

6. A coffee maker has the shape of a double cone 20 cm high. The radii at both the top and the base are 4 cm. Coffee is flowing from the top section into the bottom section at a rate of $4\,\text{cm}^3/\text{s}$. At what rate is the level of coffee in the top section falling when the coffee in the top section is 4 cm deep?