AP Calculus BC
Section 4.6 – Related Rates

1. A circle's radius is expanding at the rate of 1 cm/s. How fast is the area of the circle changing when r = 50 cm?

2. A 10-ft ladder is leaning against a wall. If Clif is pushing the base of the ladder toward the wall at a rate of 1 ft/min (Clif is weak), how fast is the top of the ladder climbing the wall when the base is 6 ft from the wall?

3. The sun is casting a shadow of a lamppost. As the sun sets, the angle of inclination of the sun gets smaller at a rate of 2 degrees/hour. If the lamp is 30 ft tall, find the rate of change of the length of the shadow when it is 40 ft long.

4. A cylindrical water tank is losing water at a rate of 3000 liters/min. If the radius of the tank is 50 meters, how rapidly is the height of the water changing? (NOTE: 1m³=1000 liters)

5. A hot-air balloon rising straight up from a level field is tracked by a range finder 500 ft from the liftoff point. At the moment the range finder's elevation angle is 45 degrees, the angle is increasing at the rate of 0.14 rad/min. How fast is the balloon rising at that moment?

6. Water runs into a conical tank at the rate of 9ft³/min. The tank stands point down and has a height of 10 ft and a base radius of 5 ft. How fast is the water level rising when the water is 6 ft deep?

7. Convoy *A* is approaching a depot from the east at 60 mph while Convoy *B* is moving north from the depot at 50 mph. How fast is the distance between the convoys changing when *A* is 4 miles from the depot and *B* is 3 miles from the depot?

8. A man 6 ft tall is walking at the rate of 3 ft/sec toward a streetlight 18 ft high.

    a. At what rate is his shadow length changing when he is 5 ft from the light?

    b. How fast is the tip of his shadow moving?