Related Rate Problems

1. Air is being pumped into a spherical balloon so that its volume increases at a rate of 100 cm^3/s. How fast is the radius of the balloon increasing when the diameter is 50 cm?

2. A ladder 10ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/s. how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?

3. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. How fast is the tip of his shadow moving when he is 40 ft from the pole?

4. Car A is traveling west at 50 mi/h and car B is traveling north at 60 mi/h. Both are headed for the intersection of the two roads. At what rate are the cars approaching each other when car A is 0.3 mi and car B is 0.4 mi from the intersection?

5. A water tank has the shape of an inverted circular cone with base radius 2m and height 4m. If water is being pumped into the tank at a rate of 2 m^3/min, find the rate at which the water level is rising when the water is 3 m deep.

6. A hot air balloon rising straight up from a level field is being tracked from a spectator 500 ft from the liftoff point. At the moment the angle of elevation is $\frac{\pi}{4}$, the angle is increasing at the rate of 0.14 rad/min. How fast is the balloon rising at that moment?

7. A mechanic is reboring a 6-in-deep cylinder to fit a new piston. The machine they are using increases the cylinder's radius one-three thousandth of an inch every minute. How rapidly is the cylinder volume increasing when the bore diameter is 3.8 inches?