1. Each side of a square is increasing at a rate of 3 cm/s. At what rate is the area of the square changing when the area is 100 cm^2?

2. A cylindrical tank of radius 8 ft is being drained at a rate of 3 ft^3/min. How fast is the height of the water changing?

3. At noon, a car starts driving south from intersection P at a rate of 50 mph. An hour later (at 1pm), a truck 200 miles east of intersection P starts driving west toward intersection P at a rate of 60 mph. At what rate is the distance between the vehicles changing at 2pm?

4. A rectangular box with square base has constant volume of 200 in^3. If the sides of the base are increasing at a rate of 2 in/s, how fast is the height changing when the base is 5 in?

   SOLUTION: $V = s^2h$. Since V=200 always, we have $200 = s^2h$. Now we take the derivative implicitly with respect to time noting that we will have to use the product rule:

   $0 = 2sh(ds/dt) + s^2(dh/dt)$.
   Now we plug in $s = 5$, $ds/dt = 2$, and $h = 200/5^2 = 8$ to get:
   $0 = 2 * 5 * 8 * 2 + 25(dh/dt)$ or $dh/dt = -32/5in/s$. Note this means the height is decreasing as expected.

5. A six foot tall ladder is leaning against a vertical wall. The base of the ladder is sliding away from the wall at a rate of 0.5 ft/s. How fast is the angle the ladder makes with the wall changing when the base of the ladder is three feet from the base of the wall?