Rates Examples (Prof. Ross's Sections)

1. The distance to Ala Moana is 2 miles. You want to get there at an average rate of 8mph. You travel the 1st mile in 12 minutes, how fast do you need to travel for mile 2?

2. A ball is thrown at an angle of 45° at $50\sqrt{2}$mph. When and where does it hit the ground?

3. What is the rate of change of the volume of a sphere with respect to its radius? With respect to its surface area?

4. A particle is constrained to move along the parabola $y = x^2$. (a) If $x'(t) = 10$units/sec, find y' at the point $(2, 4)$ (b) At what point on the curve are the ordinate and the abscissa changing at the same rate?

5. Each edge of a cube is expanding at the rate of 1cm/sec. How fast is the volume changing when the length of each edge is (a) 5cm? (b) 10cm? (c) x cm?

6. A baseball diamond is a 90 foot square. A ball is batted along the 3rd base line at a constant speed of 100ft/sec. How fast is its distance from 1st base changing when (a) it is halfway to 3rd base? (b) it reaches 3rd base?

7. A boat sails parallel to a straight beach at a constant speed of 12mph, staying 4 miles offshore. How fast is it approaching a lighthouse on the shoreline at the instant it is exactly 5 miles from the lighthouse?

8. Water flows into a hemispherical tank (flat side up) of radius 10ft. (a) Compute the rate of change of the volume of water in the tank with respect to the maximum depth at the instant when that depth is 5ft. (b) If water is flowing in at a constant rate of $5\sqrt{3}$ cubic feet/second, compute dr/dt (where r =radius of water surface) at that instant when the water is 5 feet deep.