Homework 19

1. Brad is filling spherical water balloons to throw at his friends. If water enters the balloon at a rate of $4\text{cm}^3/\text{sec}$, at what rate is the radius changing when the radius has expanded to 10cm?

2. Sal is trying to get to a point 8 miles downstream on the opposite shore of a 3 mile wide river. He can run at 8mph but only boat at 4mph. How far along the shore should he run in order to reach his desired location the fastest? (You may assume the shores of the river are parallel)

3. Suppose that $z = x^3y^2$, where both x and y are changing with time. At a certain instant when $x = 1$ and $y = 2$, x is decreasing at the rate of 2units/sec, and y is increasing at the rate of 3 units/sec. How fast is z changing at this instant? Is z increasing or decreasing?

4. A stone dropped into a still pond sends out a circular ripple whose radius increases at a constant rate of 3 ft/sec. How rapidly is the area enclosed by the ripple increasing at the end of 10 seconds?

5. Oil spilled from a ruptured tanker spreads in a circle whose area increases at a constant rate of 6 mil^2/hr. How fast is the radius of the spill increasing when the area is 9mi^2?

6. An aircraft is flying horizontally at a constant height of 4000 feet above a fixed observation point. At a certain instant the angle of elevation θ is 30° and decreasing, and the speed of the aircraft is 300 mi/hr.

   (a) Draw a picture of this scenario.

   (b) How fast is θ decreasing at this instant? Express the result in units of degrees/sec.

   (c) How fast is the distance between the aircraft and the observation point changing at this instant? Express the result in units of ft/sec. Use 1 mi=5280 ft.