Math 1110: In-Class Problems for 3.10

Problem 1  A clown is filling up a spherical balloon with helium from a tank that emits helium at a rate of 250 cm$^3$/sec. At what rate is the radius of the balloon changing when the radius is 5 cm? At what rate is the surface area of the balloon changing when the radius is 5 cm?

Problem 2  An ice cream cone with height equal to two times its diameter is filled just to the brim and is leaking through a hole in the bottom at the rate of 2 cm$^3$/min. Determine the rate at which the radius of the ice cream is changing when the height of the ice cream is 6 cm.

Problem 3  Suppose a custodian for Malott Hall is using a 17-foot ladder in a classroom to replace a light bulb. He finds the ladder resting against the wall of the classroom. The bottom of the ladder is initially 10 feet away from the wall. She pushes it so the bottom end moves horizontally towards the wall at a constant rate of $\frac{1}{3}$ ft/sec. Note that during the process, the top end of the ladder never leaves the wall and the length of the ladder does not change. How fast is the top of the ladder moving up the wall 6 seconds after she starts pushing?

Problem 4  A highway patrol plane flies 3 miles above a level, straight road at a steady 120 miles/hour. The pilot sees an oncoming car and with radar determines that at the instant the line-of-sight distance from plane to car is 5 miles, the line-of-sight distance is decreasing at the rate of 160 miles/hour. Find the car’s speed along the highway.