More Related Rates and Implicit Differentiation

1) A 10-foot plank is leaning against a wall. If at a certain instant the bottom of the plank is 5 feet from the wall and is being pushed toward the wall at a rate of $\frac{1}{2}$ ft/sec, how fast is the acute angle that the plank makes with the ground increasing?

3) You are looking at the New York ball drop on New Year's Eve at a distance of 100 m away from the base of the structure. If the ball drops at a constant rate of 2 m/s, what is the rate of change of the angle between you and the ball when the angle is $\pi/3$?

3) Water is pouring into a conical tank at the rate of 8 cubic feet per minute. If the height of the tank is 12 feet and the radius of its circular opening is 6 feet, how fast is the water level rising when the water is 4 feet deep?

19)

Consider the curve defined by $x^2 + xy + y^2 = 27$.

(a) Write an expression for the slope of the curve at any point (x, y).

(b) Determine whether the lines tangent to the curve at the x-intercepts of the curve are parallel. Show the analysis that leads to your conclusion.

(c) Find the points on the curve where the lines tangent to the curve are vertical.

20)

The radius r of a sphere is increasing at a constant rate of 0.04 centimeters per second.

a.) At the time the radius of the sphere is 10 cm, what is the rate of increase of its volume?

b.) At the time the volume of the sphere is 36π cubic cm, what is the rate of increase of the area of a cross section through the center of the sphere?

c.) At the time when the volume and the radius of the sphere are increasing at the same numerical rate, what is the radius?