Math 1205    Homework 11

Problem 1: Find the derivative of the following:
   \[ a) \ y = \tan^{-1}(4x) \]
   \[ b) \ y = \cos^{-1}(\sqrt{x+1}) \]
   \[ c) \ y = \sec^{-1}(4x) \]
   \[ d) \ \text{Find } \frac{d^2 y}{dx^2} \text{ when } xy = \tan(y) \]

Problem 2: Suppose that f(x) has an inverse and f(x) passes through the origin with slope m = 2 at that point. Find the derivative of the inverse at x = 0. (assume that the theorem is valid for this function)

Problem 3: A woman jogging at a constant rate of 10km/hr crosses a point P heading north. Then 10 minutes later a man jogging at a constant rate of 9km/hr crosses the same point heading east. How fast is the distance between the joggers changing 20 minutes after the man crosses P?

Problem 4: Gravel is being dumped from a conveyor belt at a rate of 30 cubic feet per minute. It coarseness is such that it forms a pile in the shape of a cone. The base diameter and the height are always equal. How fast is the height of the pile increasing when the pile is 10ft high?

Problem 5: A woman on a cliff that is 250 feet above the water line is watching through a telescope as a motor boat is approaching the cliff. If the boat is approaching at 20ft/sec, at what rate is the angle of the telescope changing when the boat is 250 feet from the cliff?