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

Problem 2: A street light is mounted at the top of a 15ft tall pole. A man 6ft tall walks away from the pole at a speed of 5ft/sec along a straight path. How fast is the tip of his shadow moving when he is 40ft from the pole.

Problem 3: Water is pouring into an inverted conical cistern at a rate of 8 cubic ft/min. If the height of the cistern is 12 feet and the radius of the circular opening is 6 ft, how fast is the water level rising when the water is 4 feet deep?

Problem 4: A plane is flying north at 640 miles/hr passes over Blacksburg at noon. A second plane going east at 600 miles/hr is directly over Blacksburg 15 minutes later. If the planes are flying at the same altitude how fast will they be separating at 1:15pm?

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?