8 October 2014 **Inverse Trig and Related Rates**

(1) Find the derivative of each function.

(a) $f(x) = \dfrac{1}{\arcsin(x)}$ (hint: you don't need the quotient rule)

(b) $f(x) = x \arctan \sqrt{x}$

(2) Consider the following problem: A ladder 10 ft long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1 ft/s, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6 ft from the wall?

(a) Draw a picture of this and label the horizontal and vertical distances x and y.

(b) What information has been given to you? What information do you want to find out?

(c) Write down the relationship between x and y.

(d) Differentiate both sides with respect to t, remembering the chain rule.

(e) Plug in all the givens (here you can use that $x = 6$) and solve the problem.

(3) Use the method of problem 2 to solve the following: A water tank has the shape of an inverted circular cone with base radius 2 m and height 4 m. If water is being pumped into the tank at a rate of 2 m^3/min, find the rate at which the water level is rising when the water is 3 m deep.

(4) A spotlight on the ground shines on a wall 12 m away. If a man 2 m tall walks from the spotlight toward the building at a speed of 1.6 m/s, how fast is the length of his shadow on the building decreasing when he is 4 m from the building?