Pre Calc BC **4- Derivatives** **Name_____**

1. Use the definition of the derivative (ie. the slope limit) to find the derivative of the following functions:

a) $f(x) = x^2 - 2x + 1$ b) $f(x) = 1/x$ c) $f(x) = \sqrt{x}$

2. Let f(t) be the number of centimeters of rainfall that has fallen since midnight, where *t* is the time in hours. Interpret the following in practical terms giving units.

a) $f(10) = 3.1$ b) $f^{-1}(10) = 16$ c) $f'(8) = 0.4$

3. Let $f(x) = x^3$ and $g(x) = x^4$. Use your knowledge of derivatives to determine whether the following statements are true:

a) $D[f(x) \cdot g(x)] = f'(x) \cdot g'(x)$ b) $D[f(x) \div g(x)] = f'(x) \div g'(x)$

4. Let $f(x) = x^4 - 4x^3 + 4x^2$, find all the places where $f(x)$ has a horizontal tangent and write the equation of that tangent.

5. The height of a ball thrown vertically into the air off a roof top is given by
$h(t) = 32 + 56t - 16t^2$
(where *t* is in seconds and *h* is in feet). Solve the following <u>analytically</u>.

a) When does the ball hit the ground?

b) What is the speed when it hits the ground?

c) When does the ball reach its highest point?

d) How high is it at this point?

e) When is the ball falling at a rate of 25ft/sec

6. Let $p(h)$ be the pressure in dynes per cm^2 on a diver at a depth of *h* meters below the surface of the ocean. What do each of the following mean to the diver, and what are the units?

a) $p(100)$ b) $p(h) + 20$ c) $p(h + 20)$ d) $p'(100)$ e) h, if $p'(h) = 20$

7. Sketch y = cos(x) and its slope function. Make a conjecture about D[cos(x)]