Math 171 Test 2 Name_____

1. State the following differentiation rules in plain, clear English as well as symbols: For example, the quotient rule:

In symbols $\left(\frac{f}{g}\right)' = \frac{gf' - fg'}{g^2}$.

In English: the derivative of the quotient of two functions is the denominator times the derivative of the numerator, minus the numerator times the derivative of the denominator, all divided by the square of the denominator.

a) The power rule.

b) The product rule.

c) The chain rule.

Find the following derivatives. Simplify if possible, but don't do anything silly.

2. $\frac{d}{dx}\left[\sqrt{1-x^2}\right]$

3. $\frac{d}{dx}\left[e^{-\frac{1}{x}}\right]$

4. $\frac{d}{dx}\left[x^2\cos(x)\right]$

5. $\frac{d}{dx}\left[\frac{x-3}{x+2}\right]$

6. $\frac{d}{dx}\left[\ln(\sin(x))\right]$

7. $\frac{d}{dx}\left[x^{\frac{1}{x}}\right]$

8.Find the first and second derivatives of the function $f(x) = 2x - \ln(x-1)$.

9. Describe the behavior of the function above at the point (2,4). That is, state whether the function is increasing or decreasing, leaning to the left of leaning to the right.

10. Explain in clear English why the derivative of the function $f(x) = 2^x$ is not $x \times 2^{x-1}$ (i.e. why the power rule does not apply here.)

11.What is the derivative of $f(x) = 2^x$?

12.What is the derivative of $\log_2 x$?

13.Find the linear approximation to the function $f(x) = x\sqrt{x-1}$ at (2,2)

14. Find the slope of the line tangent to the curve $\frac{1}{x} + \frac{1}{y} = 1$ at the point (2,2).

15.Use the fact that $\frac{d}{dx}\left[\sin^{-1}(x)\right] = \frac{1}{\sqrt{1-x^2}}$ and the chain rule to find $\frac{d}{dx}\left[\sin^{-1}(\cos(x))\right]$.
Then simplify your answer by using the identity $\sin^2 x + \cos^2 x = 1$

16. Suppose two quantities X and Y are related by the equation $X^2 - 2\sin(Y) = 4$.
Suppose further that Y is increasing at a rate of 3 m/sec. How fast is X changing when $Y = \pi$?