171 Exam 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 chain rule

   (c) The product rule

2. Find the derivative of the following:

   (a) $f(x) = \sqrt{x^2 + 1}$

   (b) $f(x) = e^{\sin(x)}$

(c) $f(x) = x^3 \sin(x)$

(d) $f(x) = 10^x$

(e) $f(x) = \dfrac{1 - x}{1 + x}$

(f) $f(x) = \dfrac{1 - \sin(x)}{1 + \sin(x)}$

(g) $f(x) = \sin^{-1}(x^2)$

(h) $f(x) = \ln\left(\dfrac{x^3\sqrt{x+1}}{2x+3}\right)$

(i) $f(x) = (\sin(x))^{\frac{1}{x}}$

3. Find the slope of the line tangent to the ellipse $x^2 + xy + y^2 = 7$ at the point $(1, 2)$

4. Find the linear approximation to the function $f(x) = \sqrt{x+7}$ at $a = 2$

5. Find the absolute maximum and minimum of the function $f(x) = 2x^3 - 3x^2 + 12x - 1$ on the interval $[-2, 3]$

6. Find the absolute maximum and minimum of the function $f(x) = xe^x$ on the interval $[-2, 1]$

7. A ladder 13 feet long rests on horizontal ground and leans against a vertical wall. The top of the ladder is being pulled up the wall at 0.1 feet per second. How fast is the foot of the ladder approaching the wall when the foot of the ladder is 5 feet from the wall? Hint: draw the triangle