Exam 1 Extra Practice Problems  
Math 1071Q Spring 2013

1. Find the domain of each of the following functions:
   (a) \( f(x) = 2x^3 + 7x - 5 \)
   (b) \( g(x) = \sqrt{x + 1} \)
   (c) \( h(x) = \frac{x^2 + 1}{x^2} \)
   (d) \( k(x) = \frac{3x}{\sqrt{x-2}} \)
   (e) \( j(x) = \ln(2x + 3) \)

2. Solve the following equations for \( x \):
   (a) \( \frac{1}{3} \cdot 9^{x+1} = 1 \)
   (b) \( 4^{2x} = 8^{2x+15} \)
   (c) \( 5^{2x-15} = \frac{1}{5^x} \)
   (d) \( 2 \log(x + 7) + 3 = 0 \)
   (e) \( 7 \cdot 3^{2x+4} - 1 = 0 \)
   (f) \( \log_2(x - 2) - \log_2(3x - 1) = 7 \)
   (g) \( \ln(x^2 + 2) - \ln(3x) = 0 \)

3. Second National Bank offers a saving account that earns 3.6% per year, compounded quarterly. If Emma wants to have $18,000.00,
   (a) How much should she invest right now in the account in order to have money in 18 months?
   (b) Find the effective yield.

4. Given the revenue and cost functions \( C(x) = 2x + 10 \) and \( R(x) = -2x^2 + 20x \) that represent the number of dollars spent or made respectively on the sale of \( x \) units of a certain commodity.
   (a) Find the maximal revenue.
   (b) Find the break-even quantity.

5. Sadie purchased a new laptop six months ago for $1,800.00. Based on an article she found on a consumer product information website, she estimates that the value of her computer five months from now will be $1,382.00. Assuming linear depreciation, find the equation that relates the value \( V \), of the laptop to the number of months, \( t \), since Sadie purchased the laptop.

6. Irwin Music sells its brand of acoustic guitars at $190.00 each. The company incurs costs of $55.00 to manufacture each guitar. The associated weekly fixed costs for the company are $18,500.00.
   (a) Determine the linear equation relating weekly profit, \( P \), to the number of acoustic guitars produced, \( x \).
   (b) What is the break-even quantity?
   (c) Determine the break-even revenue, rounded to the nearest cent.
7. How long will it take an investment to double if it is continuously compounded at 10% per year?

8. Find the following limits. If a limit does not exist, then explain why.
   (a) \[ \lim_{x \to 2} \frac{x^2 + x - 6}{x^2 - 8x + 12} \]
   
   (b) \[ \lim_{x \to 2} \frac{x^3 + x - 6}{x^2 - 8x} \]
   
   (c) \[ \lim_{x \to 2} \frac{x^2 + x}{x^2 - 8x + 12} \]

9. Consider the following function:
   
   \[ f(x) = \begin{cases} 
   x^2 - x + 3 & \text{if } x < 1 \\
   2 & \text{if } x = 1 \\
   \frac{6x - 6}{x^2 - 4} & \text{if } x > 1 
   \end{cases} \]

   (a) Find \( \lim_{x \to 1^+} f(x) \).
   (b) Find \( \lim_{x \to 1^-} f(x) \).
   (c) Find \( \lim_{x \to 1} f(x) \).
   (d) Where is \( f(x) \) continuous? State your answer in the interval notation.

10. Find the average rate of change of \( f(x) = 4x^3 - 2x^2 + 7x + 1 \) over the following intervals:
    (a) \([1, 4]\)
    (b) \([1, 2]\)
    (c) \([1, 1.5]\)
    (d) \([1, 1.1]\)
    (e) \([1, 1.01]\)

11. Use the limit definition of the derivative to find \( f'(x) \). Write an equation of the tangent line to the graph of \( f(x) \) at the indicated point.
    (a) \( f(x) = 5x^2 + 7x - 3, \ x = 0 \)
    (b) \( f(x) = \frac{9}{x-3}, \ x = 1 \)
12. Find the derivative. You may use whatever rules are appropriate.

(a) \( f(x) = 3x^3 - 10x^2 + 5x - 1 \)
(b) \( g(x) = 5 \ln(x^3) + 7e^x + 7e^3 \)
(c) \( h(x) = \frac{x}{3} + 3\sqrt{x} - \frac{3}{\sqrt{x}} + \frac{5}{\sqrt{x^2}} \)
(d) \( k(x) = \frac{1+x+4x^2}{x} \)