Note: Exam 2 covers the following sections: 2.3 – 2.8, 3.1 and 3.2

Disclaimer: This review is intended as a guide for a review of the Exam 2 material. The exam may not look like this review!!

1. (Section 2.3) Find the average rate of change of \( f(x) = x^2 + 5x + 4 \) on the interval \([1, 5]\).

2. (Section 2.3) A toy manufacturer has determined that the monthly demand for its best-selling toy is given by \( p = \frac{40,000 - x}{3000} \), where \( p \) is the price of the toy in dollars and \( x \) is the estimated number that can be sold for that price. Find the revenue function and the marginal revenue per toy when 10,000 toys are sold.

3. (Sections 2.4 and 2.5) Differentiate each of the functions below. **DO NOT SIMPLIFY!**
   (a) \( f(x) = (5x^2 + x - 6)(4x^2 - 3x + 2) \)
   (b) \( g(x) = \frac{2x^2 + 4x + 65}{x^2 + 2x + 10} \)
   (c) \( p = \frac{(5t^2 + t - 6)(4t^2 - 3t + 2)}{t^2 + 2t + 10} \)
   (d) \( h(x) = \sqrt[6]{6x^7 - 11} \)
   (e) \( k(x) = \left(\frac{5x - 2}{4x - 5}\right)^5 \)
   (f) \( y = -\frac{4}{(x - 3)^6} \)

4. (Section 2.6) Find \( \frac{d^2y}{dx^2} \) where \( y = \frac{1}{16}x^4 - \frac{2}{3}x^3 + \frac{3}{4}x^2 - 2x + 2 \).

5. (Section 2.7) Find \( \frac{dy}{dx} \) and evaluate it at the point \((-2, -1)\) where \( y \) is given by the equation \( \sqrt{8xy} = 3x - 10y \).

6. (Sections 2.3 and 2.8) A company is decreasing production of a product at a rate of 25 units per week. The company notes that when the price per unit is $43 then 700 units are sold and when the price per unit is lowered to $42.25 then 775 units are sold. Assume that the demand function is linear and that the variable and fixed costs are $40 and $4000, respectively. Find the rate of change of the profit with respect to time when the weekly sales are 800 units.

   *Hint: In order to get a profit function, you will need to first create a cost function and a revenue function. To get a revenue function, you will first need to create a demand function.*
7. (Section 3.1) Find the open intervals on which the function \( f(x) = x^{3\sqrt{x} - 1} \) is increasing and decreasing. 

*Be sure that you can do this problem without graphing \( f \) on your calculator.*

8. (Section 3.2) Find where all relative extrema of the function \( f(x) = 4 \left( 1 + \frac{1}{x} + \frac{1}{x^2} \right) \) occur. State whether each extremum is a relative maximum or a relative minimum.

*Be sure that you can do this problem without graphing \( f \) on your calculator.*

9. (Section 3.2) Find the maximum and minimum of the function \( f(x) = \frac{x^2}{x - 2} \) on the interval \([3, 9]\). Also, state where each extremum occurs.

*Be sure that you can do this problem without graphing \( f \) on your calculator.*

GOOD LUCK!!!!