Math 1314 Online Written Review – Test 1

For problems 1 – 4, suppose  $f(x) = 1.67x^3 - 8.35x^2 + 2.69x + 1.84$  and  $g(x) = 1.6x^2 - 7x + 1.45$ .

- 1. Graph both functions and find a good viewing window.
- 2. Find any zeros of f(x). Find any zeros of g(x).
- 3. Find any relative extrema of f(x). Find any relative extrema of g(x).
- 4. Find any points of intersection of the two functions.

5. Suppose  $f(x) = 2x^2 - 6x - 1$ . Create a table of values with a start value of 1.6 and an increment of 0.75. Then find the 6<sup>th</sup> function value in your table.

For problems 6 - 14, use the data given in this table of values.

Х	1	4	5	8	11	16	21
у	19	23	25	22	27	31	28

6. Find a linear regression model and the associated value for  $r^2$ .

- 7. Find a quadratic regression model and the associated value for  $R^2$ .
- 8. Use the quadratic regression model to predict the y value when x = 25.
- 9. Find a cubic regression model and the associated value for  $R^2$ .
- 10. Find a quartic regression model and the associated value for  $R^2$ .
- 11. Find an exponential regression model and the associated value for  $R^2$ .
- 12. Use the exponential regression model to predict the y value x = 25.
- 13. Find a power regression model and the associated value for  $r^2$ .
- 14. Find a logistic regression model and the associated value for  $R^2$ .

Using the graph shown below of f(x), find each limit.



- 15.  $\lim_{x \to 0} f(x)$
- 16.  $\lim_{x \to -2} f(x)$
- 17.  $\lim_{x \to 1^{-}} f(x)$
- 18.  $\lim_{x \to 1^+} f(x)$
- 19.  $\lim_{x \to 1} f(x)$

Find each limit for problems 20 - 25.

20.  $\lim_{x \to -1} \left( 2x^2 + 8x + 5 \right)$ <br/>
21.  $\lim_{x \to 3} \left( \frac{2x + 5}{x - 3} \right)$ <br/>
22.  $\lim_{x \to -4} \left( \frac{x^2 + 7x + 12}{x^2 - 16} \right)$ <br/>
23.  $\lim_{x \to \infty} \left( \frac{x^2 + 7x + 12}{x^2 - 16} \right)$ 

24. 
$$\lim_{x \to \infty} \left( \frac{3x+1}{9x^2+7x+2} \right)$$
  
25. 
$$\lim_{x \to \infty} \left( \frac{5x^3+2x+2}{3x+8} \right)$$
  
26. Suppose  $f(x) = \begin{cases} 3x-5, & x \le 3\\ x^2-2, & x > 3 \end{cases}$ 

- A. Find f(3).
- B. Find  $\lim_{x\to 3} f(x)$  or show that it does not exist.
- C. Determine if f is continuous at x = 3. If f is not continuous at x = 3, state why.

27. Use the limit definition of the derivative  $\left(f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}\right)$  to find the derivative of  $f(x) = x^2 + x + 3$ .

28. Find the derivative of the function using the basic rules:  $f(x) = 7x^3 - 8x^2 + 2x - 1$ 

Find the indicated numerical derivatives for problems 29 - 33.

29. Find 
$$f'(1.8)$$
 if  $f(x) = 1.87x^3 + 2.43x^2 - 9.18x - 3.75$ .

30. Find 
$$f'(4.65)$$
 if  $f(x) = \frac{4x^2 + 1}{x^2 + x + 3}$ .

31. Find 
$$f'(1.85)$$
 if  $f(x) = 6x^2 - 4e^{2x}$ .

32. Find 
$$f'(-0.875)$$
 if  $f(x) = x \ln(x^2 + 2)$ .

33. Find 
$$f''(-3)$$
 if  $f(x) = 2x^4 - 7x + 5 - \frac{3}{x}$ .

34. Write an equation of the line that is tangent to  $f(x) = 2x^2 - 6x + 5$  when x = 1.

35. Find all values of x for which the line tangent to  $f(x) = 2x^2 - 6x + 5$  is horizontal.

36. Find all values of x for which the slope of the line that is tangent to  $f(x) = 2x^2 - 6x + 5$  is -1.

37. Suppose a rocket is launched from the top of a building that is 35 feet high with initial velocity 85 feet per second. Write a position function using this information. Then use it to find the rocket's velocity two seconds after launch.

38. The population of a small city can be modeled by the function

 $P(t) = 0.003t^3 + 0.05t^2 + 0.8t + 11.4$  where *t* is given in years since the beginning of 2010 and P(t) is given in thousands.

- A. What was the population of the city at the beginning of 2012?
- B. At what rate was the population of the city changing at the beginning of 2012?

39. The average worker can produce  $N(t) = \frac{10+6t^2}{5+t^2}$  units per day t weeks after starting to work at the XYZ Company.

A. How many items per day can the average worker produce on his/her first day on the job?

B. How many items per day can the average worker produce three weeks after starting to work at XYZ?

C. At what rate is the average worker's productivity changing three weeks after starting to work at XYZ?

D. How many items per day can the average worker produce 12 weeks after starting to work at XYZ?

E. At what rate is the average worker's productivity changing 12 weeks after starting to work at XYZ?

F. Find the average worker's average rate of change in productivity over the first 12 weeks of working for XYZ.

40. Find the average rate of change of  $f(x) = 3.5x^2 - 7.9x + 12.6$  on [25, 40].