_____ / 50 total points

Test #1

Name: _____

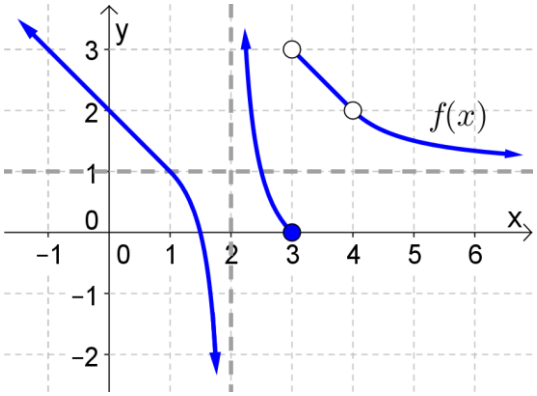
Math 140, Prof. Beydler

Wednesday, September 28, 2016

Directions: Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, notebooks, etc.). Write your answers in the indicated places, or box your answers. Good luck!

Note: If any limits are $+\infty$ or $-\infty$, say so to get full credit.

1. (3.5 points) Based on the graph of $f(x)$ shown below, find each of the following:



$\lim_{x\to-\infty} f(x)$ $\lim_{x\to+\infty} f(x)$ $\lim_{x\to2^-} f(x)$

$\lim_{x\to3^-} f(x)$ $\lim_{x\to3^+} f(x)$ $\lim_{x\to3} f(x)$

$\lim_{x\to4} f(x)$

2. (2 points) Find the following limit:

$$\lim_{x\to3^-} \frac{x+2}{x-3}$$

Answer: _____

3. (2 points) Find the following limit:

$$\lim_{x\to-2} \frac{2x^2+x-6}{x+2}$$

Answer: _____

4. (2 points) Find the following limit:

$$\lim_{x\to 4} \frac{\sqrt{x}-2}{x-4}$$

Answer: _____

5. (2 points) Find the following limit:

$$\lim_{x\to -\infty} \frac{2x^3-5x}{x^2+2x-3}$$

Answer: _____

6. (1 point) Find the following limit if $f(x) = \begin{cases} 3x^2+1 & \text{if } x \le 1 \\ 7 & \text{if } x > 1 \end{cases}$

$$\lim_{x\to 1^-} f(x)$$

Answer: _____

7. (1 point) List all value(s) of x for which $f(x) = \frac{x^2-1}{x+3}$ is **not** continuous.

Answer: _____

8. Do the following parts.
   a) (1 point) Write the limit definition of the derivative of $f(x)$.

   b) (4 points) **<u>Using the above limit definition</u>**, find the derivative of $f(x) = \frac{2}{x}$.

Answer: _____

9. (2 points) Differentiate $y = 2\sqrt{x} - \frac{1}{3x^5}$. (Write your answer with positive exponents. Rational exponents are okay.)

Answer: _____

10. (2 points) Find the derivative of $f(x) = (4x^3 + 3)^5$.

Answer: _____

11. (3 points) Find the derivative of $y = \frac{2-x^2}{3x^2+1}$ and simplify your answer.

Answer: _____

12. (2.5 points) Differentiate $y = (x+3)\sqrt{2x-5}$ and simplify your answer.

Answer: _____

13. (3 points) Find the slope of the tangent line of $y = \frac{1}{\sqrt{4x^2+1}}$ at $x = 0$.

Answer: _____

14. (3 points) Find an equation for the tangent line to $y = -2x^3 + \frac{1}{x^2}$ at the point where $x = -1$.

Answer: _____

15. Suppose a company makes the following revenue (in thousands of dollars t years after 2003): $R(t) = 0.1t^2 + 10t + 20$

a) (2 points) At what rate is the revenue growing with respect to time in 2007? (Be sure to write the units of your answer.)

Answer: _____

b) (1 point) At what *percentage* rate is the revenue growing with respect to time in 2007? (Round your percentage to two decimal places.)

Answer: _____

16. Suppose a company has a demand function of $p(x) = 25 - \frac{1}{3}x$. x represents the number of units sold, and $p(x)$ is in dollars.

a) (2 points) Find the marginal revenue.

Answer: _____

b) (2 points) Use marginal revenue to estimate the revenue derived from the sale of the 37th unit. What is the actual revenue obtained from the sale of the 37th unit? (Be sure to write the units of your answer.)

Estimated revenue: _____

Actual revenue: _____

17. (2 points) The total monthly revenue of a manufacturer is $R(q) = 240q - 0.05q^2$ dollars when q hundred units are produced during the month. Currently, the manufacturer is producing 8000 units a month and is planning to *decrease* the monthly output by 65 units. Use the derivative $R'(q)$ to estimate how the total monthly revenue will change as a result. (Be sure to write the units of your answer.)

Answer: _____

18. (3 points) Find $\frac{dy}{dx}$ given that $x^2y^3 + 2y = 3x$.

Answer: _____

19. (4 points) When the price of a water bottle is p dollars per unit, consumers demand x hundred bottles, where $3x^2 + 5p^2 = 1000$. How fast is the demand x changing with respect to time t when the unit price is \$8 and is decreasing at a rate of \$1 per month? (That is, $\frac{dp}{dt} = -1$.) (Be sure to write the units of your answer.)

Answer: _____

20. (0 points) How many hours of sleep did you get last night? _____

Note: Be sure to double check your work. And don't forget to turn in your homework! ☺