

Math 2143 - Brief Calculus with Applications

Final Exam - 2009.05.14

Name: _____

1. Determine the equation of the line which passes through the points $(-2, 1)$ and $(4, 4)$.

2. Compute the following limit:

$$\lim_{h \rightarrow 0} \frac{\sqrt{4+h} - 2}{h}$$

3. Fill in the following derivative table:

function	derivative
$\frac{d}{dx}(f(x)g(x))$	=
$\frac{d}{dx} \frac{f(x)}{g(x)}$	=
$\frac{d}{dx} f(g(x))$	=
$\frac{d}{dx} (f(x))^n$	=
$\frac{d}{dx} \ln(f(x))$	=
$\frac{d}{dx} e^{f(x)}$	=

4. Compute the tangent line to the function $f(x) = 2/(x - 1)$ at $x = 4$.

5. Sketch the graphs of the function $f(x) = \frac{x^2}{x+1}$. For each, be sure to include the following information in your work:

- a) domain
- b) x - and y -intercepts
- c) asymptotes (horizontal, vertical and, slant)
- d) critical points
- e) intervals of increase and decrease
- f) inflection points
- g) intervals of concavity

6. Approximate 2.1^8 by using the linearization of the function $g(x) = x^8$ at $x = 2$.

7. Compute the following derivative:

$$\frac{d}{dx} e^{x^2} (2x^2 - 3x + 1)$$

8. Compute the following derivatives:

a)

$$\frac{d}{dx} \ln \left(\frac{2x - 1}{2x + 1} \right)$$

b)

$$\frac{d}{dx} e^{xe^x - 1}$$

9. Find dy/dx if y is a function of x which satisfies the relationship:

$$x^2y - xy^2 = 1$$

10. Find the absolute maximum and minimum of the function

$$f(x) = x^3 + \frac{1}{2}x^2 - 2x + 5,$$

on the interval $[-2, 1]$.

11. Fill in the following table of logarithm properties. You may assume that M , N , and a are all positive numbers, with $a \neq 1$ and k and real number.

function	derivative
$\log_a(MN) =$	
$\log_a\left(\frac{M}{N}\right) =$	
$\log_a(M^k) =$	
$\log_a(a) =$	
$\log_a(a^k) =$	
$\log_a(1) =$	

12. Find the total distance travelled by an object whose velocity is given by $v(t) = t + 3$, from $t = 1$ hour to $t = 3$ hours. Here $v(t)$ is measured in mi/hr .

13. Find the area between the curves $f(x) = 4x - x^2$ and $g(x) = x^2 - 6x + 8$.

14. Compute the following integral:

$$\int \frac{5x}{2x^2 - 1} dx$$

15. Compute the following integral:

$$\int_1^3 \frac{2x^2 - 1}{5x} dx$$

16. Compute the following integral:

$$\int e^{-3x} (x^5 - x^3 + x - 1) dx$$