

Show all your work.

Name: \_\_\_\_\_

1. Complete the following.

(a) (5 points) Solve the following equation for  $x$ 

$$e^{2x+3} - 7 = 0.$$

(b) (5 points) Find the inverse of

$$y = \ln(x + 3).$$

2. (10 points) Eliminate the parameter to find an equation of the curve  $y(x)$  for

$$x = \sin(\theta)$$

$$y = \cos(\theta).$$

Describe this curve.

3. (10 points) Calculate the limit, if it exists, of

$$\lim_{t \rightarrow -3} \frac{t^2 - 9}{2t^2 + 7t + 3}$$

4. (10 points) Find the derivative of the function

$$f(x) = x^2 - 4$$

using **THE DEFINITION OF THE DERIVATIVE**. What are the domains of the function and its derivative?

5. (10 points) Use the Intermediate Value Theorem to show that there is a root of the equation

$$f(x) = 2x^3 + x^2 + 2$$

on  $(-2, -1)$ .

6. Complete the following. The first part is true or false. Circle the appropriate answer.

- (a) (5 points) If  $f$  is a differentiable function at a value  $a$ , then  $f$  is continuous at  $a$ . T or F.
- (b) (5 points) Can you give an example of a function which is continuous at a point, but not differentiable at that point?

7. (10 points) Compute  $y'$  if

$$y = \frac{e^x}{1+x^2}.$$

8. (15 points) Compute  $y'$  if

$$\sin(xy) = x^2 - y.$$

9. (15 points) Find equations of the tangent line and the normal line to the curve

$$y = (2 + x)e^{-x}$$

at the point  $(0, 2)$ .

10. (15 points) Find the dimensions of a rectangle whose area is  $1000 \text{ m}^2$  whose perimeter is as small as possible.

11. Given

$$f(x) = 2 - 2x - x^2$$

find

- (a) (5 points) Find the intervals of increase or decrease.
- (b) (5 points) Find the local maximum and minimum values.
- (c) (5 points) Find the intervals of concavity and the inflection points.

12. (10 points) Evaluate the limit

$$\lim_{x \rightarrow 0} \frac{e^{4x} - 1 - 4x}{x^2}.$$

13. (10 points) Given

$$f'(u) = \frac{u^2 + \sqrt{u}}{u}$$

find  $f(u)$  if  $f(1) = 3$ .

14. (10 points) Using  $n = 2$ , approximate the integral

$$\int_0^2 x^2 dx$$

using right-hand sums.

15. (10 points) Evaluate the integral

$$\int_0^1 v^2 \cos(v^3) dv.$$

16. (10 points) Evaluate the integral

$$\int_0^5 ye^{-0.6y} dy.$$

17. Complete the following properties of the integral

(a) (5 points)

$$\int_a^c f(x)dx + \int_c^b f(x)dx = \text{-----}.$$

(b) (15 points) State the Fundamental Theorem of Calculus. (There are two parts.)

**Bonus**

18. What happened 64 years ago today?(5pts.)

19. What is your favorite movie?(1pt.)

20. What is your favorite song?(1pt.)

21. Who do you believe is the best band ever?(1pt.)

22. What is a really good website (not smutty) that I should visit?(1pt.)

23. Write a number. Any number. Like 7, or 8. 1 will do fine.(1 pt.)