

Mastery Exam Practice 2

Your Name \_\_\_\_\_

Instructor's Name \_\_\_\_\_

Directions:

- a. No books, notes, or calculators allowed.
- b. Do all 10 problems in the spaces provided.
- c. All problems count equally.
- d. Give explanations and show calculations.
- e. Circle your answers.

**Score**

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

11. \_\_\_\_\_

Total \_\_\_\_\_

1. Compute the derivative of  $f(x) = 2/x$  using the definition of the derivative.

2. Find an equation of the tangent line to the curve  $y = 3x + \sin x$  at the point where  $x = 0$ .

3. a. If  $10^{1.69} = 49$ , what is an approximate value of  $\log_{10} 7$ ?

b. Find  $\tan(\frac{\pi}{6})$ .

4. Let  $f(x) = 2 \ln(x + 1) - 3$

a. Find a formula for  $f^{-1}$ .

b. What is the range of  $f^{-1}$ ? Explain.

5.

$$\text{Find } \frac{d}{dx} \{e^\pi + \cos(2x) \ln x\}.$$

6.

$$\text{Find } \frac{d}{dx} \left\{ 5^{(x^4 + \cos(x))} + x^6 \right\}.$$

7.

$$\text{Find } \frac{d}{dx} \left\{ \frac{e^{15x} + 12x}{\sin x} \right\}.$$

8. Sketch a graph of  
 $g(x) = 1 + 3 \cos(3x)$   
on the axes provided.  
Indicate the scale on  
both the  $x$  and  $y$  axes.

9. Suppose  $f$  is a function with derivative  $f'(x) = (x^2 - 1)e^x$ .

a. Determine the set of points  $x$  on which  $f$  is decreasing.

b. Find all the stationary points of the function  $f$ .

c. At which of the stationary point does  $f$  have a local maximum or minimum? Explain.

10. Find the equation of the tangent line to  $\sin(xy) = x + y$  at the point  $(0, 0)$ .

11. If a culture of mold doubles in size every 8 hours and there is 5 grams of mold at noon. Find an equation for the grams of mold in terms of hours past noon.