

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

Pledged: \_\_\_\_\_

Check here if you are handing in  
the Class Survey Form: \_\_\_\_\_

Rhodes College  
Math 115: Applied Calculus  
Final Exam  
Spring, 2008

Problem	Points	Score
1	20	
2	15	
3	15	
4	20	
5	10	
6	10	
7	10	
Total	100	

Note: **SHOW ALL WORK.** Answers with no support will receive no credit, even if the answer is correct. May the force be with you.

Have you taken a calculus class in the past? \_\_\_\_\_

If you have, what class, where, and when?

1. (20 pts) Find the derivative of each of the following functions.

**a.** (5 pts)  $f(t) = \frac{2t^3+3}{t^2+2t}$  (Use the quotient rule or equivalent).

**b.** (5 pts)  $F(x) = (\ln x - x^5)(3\sqrt{x} + x)$

**c.** (5 pts)  $S(x) = e^{\sin x + \cos x}$

**d.** (5 pts)  $T(x) = \frac{1}{\sqrt{x}} + 3\sqrt[3]{x}$

2. (15 pts) Let

$$f(x, y) = 3x^2 + 5y^2 - 12x - 5y$$

a. (5 pts) Find the partial derivative of  $f(x, y)$  with respect to  $x$ .

b. (5 pts) Find the partial derivative of  $f(x, y)$  with respect to  $y$ .

c. (5 pts) Locate all critical points in the domain of  $f(x, y)$ .

3. (15 pts) Consider the function  $f(x) = 2x^3e^x$ .

a. (4 pts) What is the derivative of  $f(x)$ ?

b. (4 pts) For what values of  $x$  is  $f(x)$  increasing?

c. (7 pts) Find all local maxima and minima of  $f(x)$ .

4. (20 pts) Compute each definite or indefinite integral.

**a.** (5 pts)  $\int_0^{\pi} \cos\left(\frac{x}{4}\right) dx$

**b.** (5 pts)  $\int \frac{3}{x} dx$

**c.** (5 pts)  $\int e^{2x} + 4x dx$

**d.** (5 pts)  $\int_0^3 x^2 + x^5 dx$

5. (10 pts) Determine the derivative of  $f(x) = 2x^2 - 1$  directly from the (limit) definition of the derivative (i.e. the “3-Step Method”).

6. (10 pts) Suppose the derivative of a function  $F(x)$  is given by  $f(x) = 2^x + 7$ .
- a.** (5 pts) Use a Right Riemann Sum with  $n = 4$  to approximate how much  $F(x)$  increases between  $x = 0$  and  $x = 4$ .

- b.** (5 pts) Use a Midpoint Riemann Sum with  $n = 4$  to approximate how much  $F(x)$  increases between  $x = 0$  and  $x = 4$

7. (10 pts) Compute the double integral.

$$\int_2^4 \left( \int_0^2 x^2 y + y^2 x \, dy \right) dx$$