

NAME \_\_\_\_\_

I\_\_\_\_ II\_\_\_\_ III\_\_\_\_ IV\_\_\_\_ V\_\_\_\_ VI\_\_\_\_ VII\_\_\_\_ VIII\_\_\_\_ IX\_\_\_\_ TOTAL \_\_\_\_\_

September 26  
2008

Mathematics 106a  
Calculus II  
Examination #1

Mr. Haines

(8) I. The graph of the function  $f(x) = \sqrt{x+1}$  is increasing and concave down on the interval  $[1, 10]$ . Put the following quantities in increasing order:  $L_{100}$ ,  $R_{100}$ ,  $\int_1^{10} f(x)dx$ .

(10) II. Let  $I = \int_1^3 x^2 dx$ .

A. Use the Fundamental Theorem of Calculus to evaluate  $I$  exactly.

B. Write out and add up the four terms in the approximating sums

$$L_4 =$$

$$R_4 =$$

(24) III. Evaluate. [Your final answer should not contain any integrals]:

A.  $\int x \cos(x^2 + 1) dx =$

B.  $\int \frac{\cos x}{1 + \sin^2 x} dx =$

C.  $\int_0^1 \frac{x^2}{x^3 + 4} dx =$

(10) IV. Use Euler's method with four steps on the differential equation  $y' = y - t$  to estimate  $y(3.0)$  if  $y(1.0) = 0$  by filling in the table:

STEP	0	1	2	3	4
$t$					
$y'(t)$					
$y(t)$					

(8) V. Write (but do not evaluate) an integral that gives the arc length of the graph of  $y = e^{2x}$  over the interval  $[1, 2]$ .

(10) VI. If  $A$  is the region bounded by the graphs of  $y = x^4$  and  $y = x$ , what is the volume of the solid obtained when  $A$  is revolved around the  $y$ -axis?

(10) VII. Set up and evaluate an integral that gives the area between the graphs of  $y = x^{1/3}$  and  $y = x$ . Do not approximate the area, but rather calculate it exactly.

(10) VIII. Find the solution of the initial value problem:

$$y' = \frac{x}{y} \text{ with } y(0) = 2 .$$

(10) IX. A bucket that weighs 80 lb when filled with water is lifted from the bottom of a well that is 100 feet deep. The bucket has a hole in it, so it weighs only 60 lb when it reaches the top of the well. The water leaks out at a constant rate and the rope weighs 0.45 lb/ft. Set up but do not evaluate an integral whose value is the work required to lift the bucket from the bottom of the well to the top.