

NAME \_\_\_\_\_

STUDENT ID \_\_\_\_\_

RECITATION INSTRUCTOR \_\_\_\_\_

RECITATION TIME \_\_\_\_\_

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TOTAL	/100

## DIRECTIONS

1. Write your name, student ID number, recitation instructor's name and recitation time in the space provided above. Also write your name at the top of pages 2, 3, 4 and 5.
2. The test has five (5) pages, including this one.
3. Write your answers in the boxes provided.
4. You must show sufficient work to justify all answers. Correct answers with inconsistent work may not be given credit.
5. Credit for each problem is given in parentheses in the left hand margin.
6. No books, notes or calculators may be used on this test.

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- (12) 1. Find the integral by means of the substitution  $u = \sqrt{x}$ .

$$\int \frac{\sqrt{x} + 1}{x + 1} dx$$

(10) 2. Find the integral  $\int \frac{3x}{x^2 - 4x + 4} dx$ .

(18) 3. Determine whether the improper integral converges or diverges. If it converges find its value. Important: Show clearly how limits are involved.

(a)  $\int_1^{\infty} \frac{1}{x^{3/2}} dx$

(b)  $\int_0^{\frac{\pi}{2}} \tan x dx$

- (10) 4. Let  $R$  be the region between the graphs of the equations  $y = 3x$  and  $y = x^2 + 2$ . Use the washer method to set up an integral for the volume  $V$  of the solid generated by revolving the region  $R$  about the  $x$ -axis. Do not evaluate the integral.

$$V = \int$$

- (12) 5. Let  $R$  be the region between the graph of  $f(x) = \sin x$  and the  $x$  axis on the interval  $[\frac{\pi}{4}, \frac{\pi}{2}]$ . Find the volume of the solid generated by revolving  $R$  about the  $y$  axis.



- (10) 6. Find the area  $S$  of the surface generated by revolving about the  $x$  axis the graph of  $y = \frac{x^3}{3}$  on the interval  $[0, 1]$ .

$S =$
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- (10) 7. A tank in the shape of an inverted cone 12 feet tall and 3 feet in radius is full of water. Set up an integral for the work  $W$  required to pump all the water over the edge of the tank. Do not evaluate the integral. (Water weighs 62.5 lbs/ft<sup>3</sup>).

$W = \int$
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- (10) 8. Find the center of gravity  $(\bar{x}, \bar{y})$  of the region  $R$  between the graphs of  $y = 2 - x$  and  $y = x - 2$  on the interval  $[0, 2]$ . You may use symmetry for one of the coordinates, but must show complete work for the other.

$\bar{x} =$	$\bar{y} =$
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- (8) 9. Find the third Taylor polynomial  $p_3(x)$  of  $f(x) = \tan^{-1} x$ .

$p_3(x) =$
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