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| NAME | | |
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| RECITATION TIME | TOTAL | /100 |

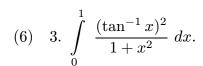
DIRECTIONS

- 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, and 4.
- 2. The test has four (4) 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.

Find the integrals in problems 1-5.

(6)
$$1.(a) \int \sin^3 x \cos^2 x dx.$$

(6) 2. $\int \tan^3 x \sec^3 x dx.$

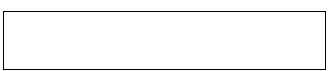




(15) 4. $\int \frac{x^2}{(a^2-x^2)^{\frac{3}{2}}} dx$, where a is a positive constant.



(15) 5. $\int \frac{3x^2 - 1}{(x - 1)(x^2 + 1)} dx$



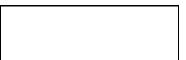
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$$\int \frac{1}{x\sqrt{x+1}} dx$$
 as an integral of

$$\int \frac{1}{x\sqrt{x+1}} \, dx = \int du$$

7. Determine whether each integral is convergent or divergent. Find its value if it is (12)convergent. Important: You must show clearly how limits are involved.

(a)
$$\int_{1}^{\infty} \frac{\ln x}{x} dx$$



(b)
$$\int_{0}^{1} \frac{1}{\sqrt{1-x^2}} dx$$



8. Find the length of the curve $y = \ln(\sec x), \ 0 \le x \le \frac{\pi}{4}$. [Note: $\frac{d}{dx} \ln(\sec x + \tan x) = \sec x$].

- (12) 9. Consider the lamina bounded by the curves $y=x^3, y=1, x=0$ and with density $\rho=1$. Find the following:
 - (a) The mass m of the lamina.

m =

(b) The moment M_y of the lamina about the y-axis.

 $M_y =$

(c) The moment M_x of the lamina about the x-axis.

 $M_x =$

(d) The center of mass $(\overline{x}, \overline{y})$ of the lamina.

 $(\overline{x}, \overline{y}) =$

(10) 10. Determine whether the sequence converges or diverges. If it converges, find the limit. (You need not show work for this problem).

(a)
$$a_n = \frac{3^n}{4^{n+2}}$$



(b) $\left\{ \frac{3 + (-1)^n}{n^2} \right\}$



(c) $a_n = \frac{\sqrt{n}}{\ln n}$



(d) $a_n = \frac{n^3}{1+n^2}$



(e) $a_n = \frac{(-1)^n n!}{(n+1)!}$

