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RECITATION TIME	TOTAL	/100

DIRECTIONS

- 1. Write your name, 10-digit PUID, 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 unless otherwise stated in the problem. 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.

(8) 1.
$$\int_0^{\frac{\pi}{4}} \sec^4 x \, dx$$

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

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(10) 3.
$$\int \frac{dt}{\sqrt{t^2 - 2t + 5}}$$

(Hint: $\frac{d}{dx} \ln |\sec x + \tan x| = \sec x$)



$$(10) \quad 4. \int \frac{dx}{x(1+\sqrt{x})}$$

(Hint: First make a substitution to express the integrand as a rational function)



(8) 5.
$$\int \frac{x^2 + 5}{x^2 + 4} dx$$

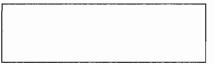


(9) 6. Determine the constants in the partial fraction expansion

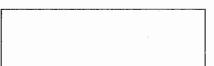
$$\frac{5x^2 - x + 3}{x(1+x^2)} = \frac{Ax + B}{x^2 + 1} + \frac{C}{x}$$

$$A = , B = , C =$$

7. Determine whether each integral is convergent or divergent. Find its value if it is convergent. Important: You must show clearly how limits are involved. a) $\int_0^\infty \frac{x}{(x^2+2)^2} dx$



b) $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx$



(7) 8. Set up but do not evaluate an integral for the length of the curve $y=\cos x, 0\leq x\leq 2\pi$

- (12) 9. Consider the lamina in the first quadrant bounded by the curves $y = 1 x^2$, x = 0 and y = 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)
$$a_n = \frac{n+1}{3n-1}$$

(b) $\left\{\cos\frac{n\pi}{4}\right\}$

.

(c) $\left\{ \frac{(2n-1)!}{(2n+2)!} \right\}$

(d) $\{2^{-n}\}$

.

(e) $a_n = n \sin\left(\frac{1}{n}\right)$