

PRINT NAME: _____

PERM NUMBER: _____

- (1) No books and notes are allowed.
- (2) You may use a calculator and a notecard.
- (3) Show your work in details.

Problem	Score	Problem	Score
1 (10)		2 (50)	
3 (20)		4 (20)	
5 (60)		6 (20)	
7 (20)			
Total (200)			

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- (1) (10 points) A particle is moving along a line so that its velocity at time t is given by

$$v(t) = t^2 + t + 1$$

where t is measured in seconds and $v(t)$ is measured in meters per second. Find the distance traveled by the particle from $t = 1$ to $t = 2$.

- (2) (50 points) Evaluate the following integrals.

(a) (10 points) $\int_0^{\pi/2} \sin^5 x dx$

(b) (10 points) $\int \frac{e^{2x}}{e^x + 1} dx$

(c) (10 points) $\int_1^e x(\ln x)^2 dx$

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(d) (10 points) $\int x \cos(2x) dx$

(e) (10 points) $\int \frac{x^2}{x^2 - 5x + 4} dx$

- (3) (20 points) Use (a) Trapezoidal Rule and (b) Simpson's Rule to approximate the integral $\int_0^\pi \sin x dx$ by dividing $[0, \pi]$ into six subintervals. Also find the errors in the approximations.

- (4) (20 points) Explain why the integral $\int_0^1 x \ln x dx$ is improper and evaluate its value if it converges.

(5) (60 points) Let C be the curve

$$y = \frac{x^3}{6} + \frac{1}{2x}$$

with $1 \leq x \leq 2$ and let R be the region below the curve.

(a) (10 points) Find the area of R .

(b) (10 points) Find the volume of the solid obtained by rotating R around the x -axis.

(c) (10 points) Find the volume of the solid obtained by rotating R around the y -axis.

(d) (10 points) Find the length of C .

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(e) (10 points) Find the area of the surface obtained by rotating C around the x -axis.

(f) (10 points) Find the area of the surface obtained by rotating C around the y -axis.

(6) (20 points) Find the Cartesian equations of the following parametric curves.

(a) (10 points) $x = 4t + 1$, $y = t + 1$

(b) (10 points) $x = t^2$, $y = t^2 + t + 1$

- (7) (20 points) Suppose that 2 J of work are needed to stretch a spring from its natural length of 30 cm to a length of 42 cm. How much work is needed to stretch it from 35 cm to 40 cm?