

PRINT NAME: _____

STUDENT ID NUMBER: _____

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

Problem	Points	Score
1	30	
2	20	
3	50	
Total	100	

(1) (30 points) Let R be the region bounded by the curves $y = x^2$ and $y = x^3$.

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

(b) (10 points) Let S_1 be the solid obtained by rotating R around the x -axis. Find the volume of S_1 .

(c) (10 points) Let S_2 be the solid obtained by rotating R around the y -axis. Find the volume of S_2 .

- (2) (20 points) If 6 J of work are needed to stretch a spring from 10 cm to 12 cm and another 10 J are needed to stretch it from 12 cm to 14 cm, what is the natural length of the spring?

(3) (50 points) Evaluate the following integrals.

(a) (10 points) $\int_0^{\pi/2} \sin^3 x \cos^4 x dx$

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

(c) (10 points) $\int \frac{dx}{1 - \sqrt{x}}$

(d) (10 points) $\int \frac{x^3}{x^2 + 2x - 3} dx$

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