

MATH 1311 FALL 2009

CALCULUS I



THIRD MIDTERM EXAM

WEDNESDAY, DECEMBER 2

YOUR NAME (PLEASE PRINT):

Instructions: This is a closed book, closed notes exam. **Use of calculators is not permitted.** Except on multiple choice questions, you must justify all of your answers to receive credit. Notation is important, and points will be deducted for incorrect use. Please do all of your work on the paper provided.

The Honor Code requires that you neither give nor receive any aid on this exam.

Please indicate that you have read and understood these guidelines by signing your name in the space provided:

Pledged: _____

Problem	1	2	3	4	5	6	7	8	9	10
Points	5	5	5	5	15	10	10	20	15	10
Score										

Total: _____

HW: _____

Exam 1: _____

Exam 2: _____

Average: _____

1. If $\int_4^9 f(x) dx = 3$ then $\int_2^3 xf(x^2) dx$ is equal to:

a. 6

b. 9

c. $\sqrt{3}$

d. $3/2$

2. If $g(x) = \int_0^{x^2} \frac{t}{1+t^3} dt$ then $g'(x)$ is equal to:

a. $\frac{x}{1+x^3}$

b. $\frac{2x^3}{1+x^6}$

c. $\frac{x^2}{1+x^6}$

d. $\frac{2x^2}{1+x^3}$

3. Evaluate

$$\lim_{n \rightarrow \infty} \frac{1}{n} \left(\left(\frac{1}{n} \right)^3 + \left(\frac{2}{n} \right)^3 + \left(\frac{3}{n} \right)^3 + \cdots + \left(\frac{n}{n} \right)^3 \right).$$

a. $1/4$

b. $1/2$

c. 0

d. 1

4. If $\int_{-1}^2 f(x) dx = 7$ and $\int_{-1}^2 g(x) dx = 12$ then $\int_{-1}^2 [2f(x) + 3g(x)] dx$ equals:

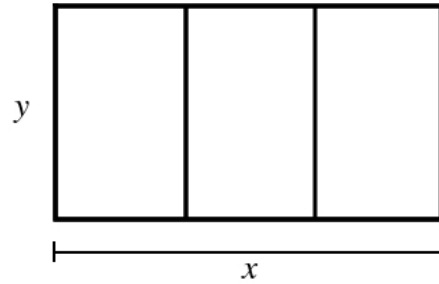
a. 19

b. 50

c. Cannot be determined

d. 45

5. A farmer wants to fence an area of 1.5 million square feet in a rectangular field and then divide it into thirds with additional fencing as shown in the diagram below. What dimensions will minimize the total length of fencing used?



6.

a. Verify that $F(x) = \sin x - x \cos x$ is an antiderivative of $f(x) = x \sin x$.

b. Use part **a** to evaluate $\int_0^\pi x \sin x \, dx$.

7. A particle moves along the x -axis with acceleration at time t given by $a(t) = t - 3$. At $t = 0$ the particle is at $x = 1$ and is moving with a velocity of 4 units per second.

a. Find the position of the particle at any time t .

b. Determine every position at which the particle is at rest.

8. Evaluate the integral.

a. $\int_0^8 \frac{x}{\sqrt{x+1}} dx$

b. $\int v(v^2 + 2)^{30} dv$

c. $\int_1^8 \sqrt[3]{\frac{5}{x}} dx$

d. $\int_{-1}^1 [e^{2z} - \cos \pi z] \, dz$

9. Find the total area trapped between the curve $y = 2x - x^2 - x^3$ and the x -axis.

10. Let R denote the region bounded by the curves $y = 0$, $x = 1$ and $y = 3x - x^2$.

a. Sketch R .

b. Find the volume of the solid obtained by rotating R about the x -axis.

- c. Find the volume of the solid obtained by rotating R about the y -axis.

