

Name: _____

Instructor: _____

Math 125 Exam III
November 30, 2004

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for 1 hour and 15 min.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 9 pages of the test.

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle

1. a b c d e

5. a b c d e

2. a b c d e

6. a b c d e

3. a b c d e

7. a b c d e

4. a b c d e

Please do NOT write in this box:

Multiple Choice	
8.	
9.	
10.	
11.	
Total	

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Multiple Choice Questions (8 Points Each)

1. The curve $y = x^4$ and the line $y = 2 - x$ intersect at two points, one of which is $x = 1$. Newton's Method can be used to estimate the other point of intersection. Using $x_1 = -1$, find x_2 .

(a) $x = -\frac{1}{5}$

(b) $x = -\frac{1}{3}$

(c) $x = -\frac{5}{3}$

(d) $x = -\frac{5}{2}$

(e) $x = -\frac{7}{3}$

2. A manufacturer estimates that when x units of a particular commodity are produced each month, the total cost (in dollars) will be

$$C(x) = \frac{1}{8}x^2 + 4x + 200$$

and that the revenue is $x p(x)$, where $p(x) = 49 - x$ dollars represents the price. Determine the number of units that corresponds to maximum profit.

(a) $x = 30$

(b) $x = 24$

(c) $x = 21$

(d) $x = 20$

(e) $x = 15$

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3. Calculate the following indefinite integral

$$\int (4 - 3t^2)(4t + 1)dt.$$

(a) $-2t^5 - t^4 + 8t^3 + 4t^2 + C$

(b) $-3t^4 - t^3 + 8t^2 + 4t + C$

(c) $-36t^2 + 16 + C$

(d) $-12t^4 - 3t^3 + 16t^2 + 4t + C$

(e) $-\frac{3}{4}t^4 - t^3 + 8t^2 + 4t + C$

4. Let $g(x) = \int_{\sin x}^2 \frac{1}{\sqrt{t^4 + 6}} dt$. What is $g'(x)$?

(a) $\frac{1}{\sqrt{\sin^4 x + 6}}$

(b) $\frac{-1}{\sqrt{\sin^4 x + 6}}$

(c) $\frac{-2 \sin^3 x}{(\sin^4 x + 6)^{\frac{3}{2}}}$

(d) $\frac{-\cos x}{\sqrt{\sin^4 x + 6}}$

(e) $\frac{\cos x}{\sqrt{\sin^4 x + 6}}$

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5. Evaluate the indefinite integral

$$\int \frac{\sec^2(\sqrt{x})}{\sqrt{x}} dx.$$

(a) $\frac{1}{2} \tan(\sqrt{x}) + C$

(b) $2 \tan(\sqrt{x}) + C$

(c) $\tan^2(\sqrt{x}) + C$

(d) $\frac{1}{2} \sec(\sqrt{x}) \tan(\sqrt{x}) + C$

(e) $2 \sec(\sqrt{x}) \tan(\sqrt{x}) + C$

6. Evaluate the definite integral

$$\int_2^3 x\sqrt{x-2} dx.$$

(a) 3

(b) $\frac{114}{15}\sqrt{3} - \frac{64}{15}\sqrt{2}$

(c) $\frac{-14}{15}$

(d) $\frac{37}{15}\sqrt{3} + \frac{16}{15}\sqrt{2}$

(e) $\frac{26}{15}$

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7. The area of the region bounded by the line $y = 2x + 1$ and the curve $y = x^2 + 1$ is:

(a) $\frac{16}{3}$

(b) $-\frac{4}{3}$

(c) $\frac{4}{3}$

(d) $\frac{44}{15}\pi$

(e) $\frac{8}{3}$

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Partial Credit

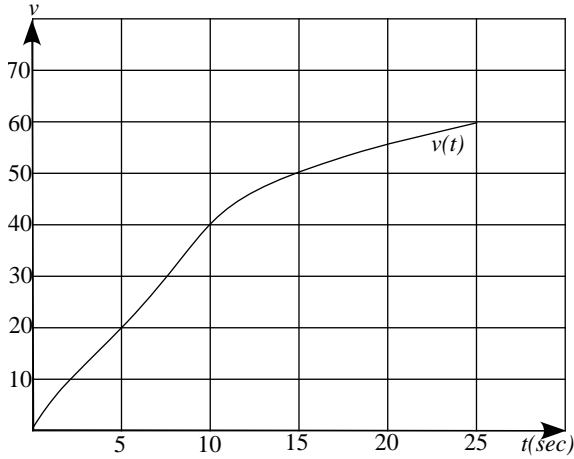
You must show all supporting work on the partial credit problems to receive full credit!

8. (12 points) A farmer wants to build a rectangular enclosure with the front side made of material costing \$10 per foot and with the other three sides (back, left, right) of material costing \$5 per foot. The farmer has \$600 to spend. What dimensions ensure the maximum area for the enclosure? Show all work, and *make sure you justify that your answer is a maximum.*

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9. (12 points) The graph of the velocity function $v(t)$ of a car accelerating from rest to a speed of 60 miles per hour over a period of 25 seconds is shown below.



a) Rectangles can be used to estimate the distance traveled during this period. Sketch the rectangles that you would use to calculate R_5 in the graph above. Then write the sum in the space below. (Recall that R_5 is a Riemann sum using 5 subintervals and right hand endpoints) You do not have to simplify your answer.

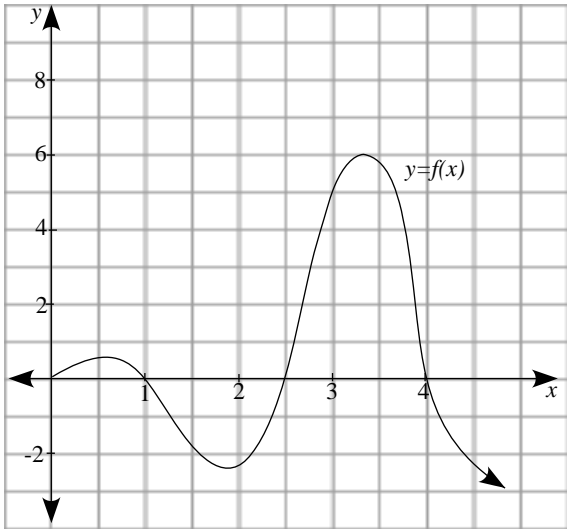
b) Find an expression for the distance traveled as a limit and write it below. Do not evaluate the limit.

c) Find an expression for the distance traveled as an integral and write it below. Do not try to evaluate the integral.

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10. (10 points) The graph of a function f is shown below. Let $g(x) = \int_0^x f(t) dt$.



a) Where does g have a relative minimum on the interval $[0, 5]$? Justify your answer.

b) Where does g have a relative maximum on the interval $[0, 5]$? Justify your answer.

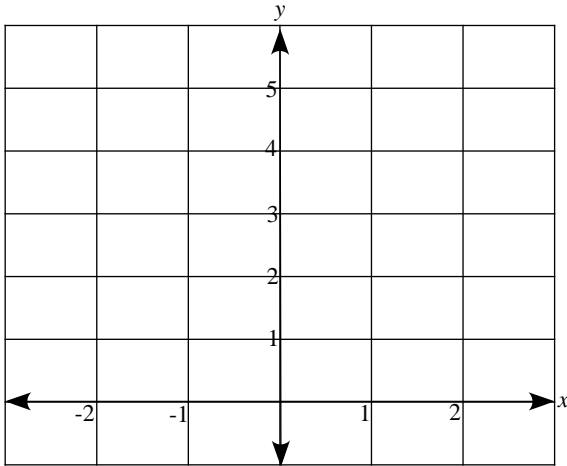
c) Suppose $g(1) = 1$, $g(2.5) = -2.5$, and $g(4) = 4$. Sketch a rough graph of g . Label your graph clearly.

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11. (10 points) Let R be the region determined by the curve $y = x^2 + 1$ and the line $y = -x + 3$.

a) Sketch R in the grid below.



b) Let S be the solid obtained by rotating R about the line $y = -1$. Sketch a cross-section of S perpendicular to the x -axis and express the area of this cross-section as a function of x .

c) Set up, but do not evaluate, an integral for the volume of S .