

MATH 142

Midterm 1

October 3, 2002

NAME (please print legibly): _____

Your University ID Number: _____

Circle your Instructor's Name along with the Lecture Time:

Zokhrab Moustafaev (MWF 9:00 - 9:50) Carl Mueller (MW 2:25 - 4:40)

- No calculators are allowed on this exam.
- Please show all your work. You may use back pages if necessary. You may not receive full credit for a correct answer if there is no work shown.
- Please put your simplified final answers in the spaces provided.

QUESTION	VALUE	SCORE
1	10	
2	14	
3	14	
4	14	
5	14	
6	14	
7	18	
8	10	
9	12	
10	10	
11	10	
12	10	
TOTAL	150	

1. (10 pts) Suppose that we are trying to solve

$$x^4 + x - 1 = 0$$

using Newton's method. Assume that our first guess was $x = 1$. What would the second guess be?

2. (14 pts) A cylindrical can must have a volume of 10 cubic inches. The top and bottom cost 1 cent per square inch, while the side costs 2 cents per square inch. Find the dimensions of the can which minimizes the cost.

3. (14 pts) Find the point on the line $y = x$ which is closest to $(1, 2)$.

4. (14 pts) Consider the curve defined by

$$y = \frac{x^2 - 4x + 1}{2x^2 + 5x - 3}.$$

(a) (7 pts) Find the vertical asymptotes.

(b) (7 pts) Find the horizontal asymptotes.

5. (14 pts) Let

$$f(x) = x^4 - 2x^3 - 12x^2 + 3x - 2$$

(a) (7 pts) Find the intervals on which $f(x)$ is concave up and concave down.

(b) (7 pts) Find the points of inflection.

6. (14 pts) Let

$$f(x) = \frac{x + 1}{x^2 + x + 1}$$

(a) (6 pts) Find the intervals of increase and decrease for $y = f(x)$.

(b) (4 pts) Find the points x at which $f(x)$ has a local maximum.

(c) (4 pts) Find the points x at which $f(x)$ has a local minimum.

7. (18 pts) Find the most general antiderivatives of the following functions.

(a) (6 pts)

$$f(x) = x^{1/2} + x^{-1/2}$$

(b) (6 pts)

$$f(x) = e^x + x^2$$

(c) (6 pts)

$$f(x) = 4 \sin(2x) + 5 \cos(x)$$

8. (10 pts) Assuming that

$$f''(x) = 2x + e^{-x}$$

$$f(0) = 1$$

$$f'(0) = 4$$

find $f(x)$.

9. (12 pts) A particle moves in a straight line, with an acceleration of $a(t) = 2 \text{ ft/sec}^2$. Let $s(t)$ be the particle's position at time t and let $v(t)$ be its velocity. If $s(1) = 10 \text{ ft}$, and $v(1) = 8 \text{ ft/sec}$,

(a) (6 pts) Find $v(t)$.

(b) (6 pts) Find $s(t)$.

10. (10 pts) Find the Riemann sum corresponding to $n = 4$ for the integral

$$\int_2^6 x^2 dx$$

using left hand endpoints as sample points.

11. (10 pts) Evaluate the integral by interpreting it in terms of areas.

$$\int_1^3 (1 + 3x) dx$$

12. (10 pts) Let

$$\int_2^8 f(x) dx = 5$$

$$\int_6^8 f(x) dx = 2$$

$$\int_4^6 f(x) dx = 1$$

Find

$$\int_2^4 f(x) dx$$