

MATH 142

Midterm 2

November 5, 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 final answers in the spaces provided.

QUESTION	VALUE	SCORE
1	30	
2	26	
3	15	
4	39	
5	15	
6	15	
7	15	
8	15	
9	15	
10	15	
TOTAL	200	

1. (30 pts) Solve the following integrals.

(a) (10 pts)

$$\int 3 \sin(2x) dx$$

(b) (10)

$$\int \frac{2}{\sqrt{x}} dx$$

(c) (10)

$$\int_{-4}^{-2} \frac{2+x}{5x} dx$$

2. (26 pts)

(a) (13 pts) Find

$$\frac{d}{dx} \int_0^{\sqrt{x}} (1+t^4) dt$$

(b) (13 pts) Find

$$\frac{d}{dx} \int_{x^2}^0 \sin^4(t) dt$$

3. (15 pts) Suppose that you keep track of the rainfall, in inches per hour, for Rochester. Time is measured in hours. It is now time 0. At time t , it is raining at $(t^2 + t)/10,000$ inches per hour. Find the amount of rainfall over a 3-day period, starting now.

Hint: How many hours are in 3 days?

4. (39 pts) Solve the following integrals.

(a) (13 pts)

$$\int \frac{\sin(\ln(x))}{x} dx$$

(b) (13 pts)

$$\int_0^{\pi/4} \cos(2x)e^{\sin(2x)} dx$$

(c) (13 pts)

$$\int_0^1 \frac{e^x}{e^x + 1} dx$$

5. (15 pts) Find the area between the curves

$$y = 3x + 3$$

$$y = 3 - x^2$$

between $x = 0$ and $x = 1$.

6. (15 pts) Find the area between the curves

$$y = x^2 - 1$$

$$y = x + 1$$

Hint: Find the points at which the curves intersect.

7. (15 pts) Find the volume of the solid obtained by rotating the region bounded by the given curves, about the x -axis.

$$y = x^2$$

$$y = 2x$$

8. (15 pts) Use the method of cylindrical shells to find the volume generated by rotating the region bounded by the given curves about the y -axis.

****WARNING** Unless you use the shell method, you will not get full credit.**

$$y = e^{x^2}$$

$$y = 0$$

$$x = 0$$

$$x = 4$$

9. (15 pts) A spring at rest has length of 1 meter. Assuming that the spring constant k equals 10 Newtons per meter squared. Calculate the work required to stretch the spring so as to increase its length to 3 meters.

10. (15 pts) Find the average value of $f(x) = x\sqrt{1+x^2}$ over $[0, 4]$.