

# MATH 142

## MIDTERM EXAM I

February 21, 2002

NAME (please print legibly): \_\_\_\_\_

Your University ID Number: \_\_\_\_\_

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

Felea (2 o'clock)   Knightly (9 o'clock)   Kojcinovic (10 o'clock)   Voloshina (2 o'clock)

- 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	18	
2	10	
3	10	
4	10	
5	10	
6	10	
7	8	
8	12	
9	12	
TOTAL	100	

1. (18 pts) Let  $f(x) = \frac{x-3}{x+2}$ .

(a) Find the domain of  $f$ .

ANSWER: \_\_\_\_\_

(b) Find the intercepts of  $f$ .

ANSWER: \_\_\_\_\_

(c) Find the intervals on which  $f$  is increasing and decreasing.

ANSWER: \_\_\_\_\_

(d) Find the intervals on which  $f$  is concave up and concave down.

ANSWER: \_\_\_\_\_

(e) Find the horizontal and the vertical asymptotes of  $f$ .

ANSWER: \_\_\_\_\_

(f) Sketch the graph of the curve  $y = f(x)$ .

**2. (10 pts)** Find the dimensions of a rectangle with maximum area whose perimeter equals 12.

ANSWER: \_\_\_\_\_

**3. (10 pts)** Use the Newton's Method to find the second and the third approximations,  $x_2$  and  $x_3$ , to the root of  $x^3 - 2x + 3 = 0$  near your initial guess  $x_1 = 1$ .

(a) What is  $x_2$ ?

ANSWER: \_\_\_\_\_

(b) What is  $x_3$ ?

ANSWER: \_\_\_\_\_

4. (10 pts) Assuming that  $f''(x) = 2x + e^x$ ,  $f(0) = 2$ , and  $f'(0) = 1$ , find  $f(x)$ .

ANSWER: \_\_\_\_\_

5. (10 pts) Find the Riemann sum corresponding to  $n = 4$  for the integral

$$\int_2^6 \frac{12x}{x-1} dx$$

using left hand points as sample points.

ANSWER: \_\_\_\_\_

**6. (10 pts)** Differentiate the following functions.

(a)  $\int_x^0 e^{t^2} dt$

ANSWER: \_\_\_\_\_

(b)  $\int_0^{\sin x} \sqrt{r^2 + 1} dr$

ANSWER: \_\_\_\_\_

**7. (8 pts)** Find the area under the curve  $y = \cos x$  and over the interval  $[0, \pi/2]$ .

ANSWER: \_\_\_\_\_

8. (12 pts) Evaluate the following definite integrals.

(a)  $\int_1^4 \frac{t + t^2}{\sqrt{t}} dx$

ANSWER: \_\_\_\_\_

(b)  $\int_{\ln 2}^{\ln 4} 2e^x + 3 dx$

ANSWER: \_\_\_\_\_

(c)  $\int_0^{\pi/4} \frac{5}{1 + x^2} dt$

ANSWER: \_\_\_\_\_

9. (12 pts) Evaluate the following indefinite integrals.

(a)  $\int \sin x + 2 \cos x \, dx$

ANSWER: \_\_\_\_\_

(b)  $\int \frac{4}{x} + \frac{x}{4} \, dx$

ANSWER: \_\_\_\_\_

(c)  $\int \sec^2 x - \frac{1}{\sqrt{1-x^2}} \, dx$

ANSWER: \_\_\_\_\_