

Math 141-005/006  
Exam 3

Name \_\_\_\_\_

Answer each problem completely and show all work in the space provided to get full credit. You may use the back of the page, but make a note of it. Carefully read the directions for each problem.

**Problem 1.** An open box is to be made from a  $6 \times 6$  square piece of cardboard by removing equally sized squares from each corner and bending the sides up. Find the maximum volume. Be sure to clearly show what function you are maximizing, and the domain of the function.

**Problem 2.**

(a) Estimate  $\int_{-2}^2 x^3 - 2x^2 + 3 dx$  with four rectangles and right hand endpoints.

(b) Estimate  $\int_{-2}^4 2x - 3 dx$  with three rectangles and midpoints.

(c) Write the limit-sum definition of  $\int_2^4 x^2 + 3x dx$  with right hand endpoints.

**Problem 3.** Find  $f(x)$ , given that  $f''(x) = 4 - 6x - 40x^3$ , where  $f(0) = 2$ , and  $f(1) = 6$ .

**Problem 4.** Evaluate the derivatives

$$(a) \frac{d}{dx} \left[ \int_2^{\arctan(x)} \frac{1}{t^2 + 1} + \tan(t) dt \right]$$

$$(b) \frac{d}{dt} \left[ \int_t^\pi x^2 e^{2x^3} dx \right]$$

**Problem 5.** Evaluate the indefinite integrals

(a)  $\int \frac{1}{3x^2} - 12x + \frac{2}{1+x^2} dx$

(b)  $\int \csc(x)(\cot(x) + \sin(x)) dx$

(c)  $\int \frac{2x^4 - 3\sqrt{x}}{x} dx$

(d)  $\int \frac{2x}{(x^2 + 3)^3} dx$

(e)  $\int x^2 e^{2x^3} dx$

**Problem 6.** Evaluate the definite integrals

(a)  $\int_0^\pi \cos(x) - \sin(x) dx$

(b)  $\int_1^{16} \frac{1}{4x} dx$

(c)  $\int_0^{13} \frac{1}{(1+2x)^{2/3}} dx$