

# Math 180

## FOURTH HOUR EXAM

NAME \_\_\_\_\_

### General Notes:

1. Show work.
2. Look over the test first, and then begin.
3. Calculators are not permitted on this exam.

Friday, December 3, 2010  
90 pts (will be adjusted to 100 pts. in  
the gradebook)

I. Consider the function  $y = x^4 - 2x^2$  (problem 15, page 268)

- a. (15 pts) Find the critical points of the function and say where (over what intervals) the function is increasing and where it is decreasing.

(problem I continued)

- b. (10 pts.) Take the second derivative and classify the critical points as local maxima, local minima, and points of inflection, saying why in each case.

II. Antiderivatives and such

- a. Antiderivatives (5 pts each) Find the following antiderivatives. Remember the constant of integration!

$$\int (3x^2 + 2x + 1)dx$$

$$\int \cos(x)dx$$

$$\int e^x dx$$

$$\int \sec^2(x)dx$$

$$\int \frac{dx}{1+x^2}$$

- b. (10 pts.) Suppose that we know that the derivative of some function  $f(x)$  satisfies  $\frac{df}{dx} = 4x + 3$  and that  $f(0) = 2$ . What is  $f(x)$ ?

### III. Optimization

1. (15 pts.) (Problem 48 on page 281 of the textbook). It costs  $c(x) = x^3 - 20x^2 + 20000x$  to manufacture  $x$  items. For what value of  $x$  is the *average* cost,  $c(x)/x$ , minimized?

2. (15 pts.) (Problem 8 on page 277) A 216 square meter rectangular pea patch is to be enclosed by a fence and divided into two equal parts by another fence parallel to one of the sides. What dimensions for the outer rectangle will require the smallest total length of fence? How much fence will be needed? Begin by drawing a diagram of the pea patch.