

Problem Set 1

Basic Calculus

Due Date:

In the following problems, x and y are variables, and a, b, c , represent numbers.

1. Differentiate each of the following functions with respect to x :

a. $3x^2 + 2xy$

b. ax^{b+1}

c. e^{-x^2}

d. $\ln(e^{2x})$

e. $f(y)$, where $y = \ln(x)$

f. $f(x, y)$, where $y = \ln(x)$

2. Obtain an expression for dy/dx for each of the following equations:

a. $x + 3 = y^2$

b. $y = 3xy$

c. $f(x, y) = g(x, y)$

3. Which if any of the following functions are strictly concave or strictly convex?

a. e^x

b. x^2

c. \sqrt{x}

d. $\ln(x)$

e. x^3

4. Find all the maxima and minima of the following functions. Be sure to use the second-order condition to verify whether you have a maximum or minimum in each case.

a. $3x^3 - 81x$

b. $\ln(x) - x$

5. Solve the following maximization problems using the Lagrangian method.

a. $\max_{x,y} 3x^2 + 2y$, subject to $y + x = 1$

b. $\max_{x,y} xy$, subject to $ax + by = c$