ECONOMICS 207
SPRING 2008
LABORATORY EXERCISE 5

Problem 1. Solve the following systems of equations for x_1 and x_2 using the method of substitution.
a.

$$\{x_1 = 64,\ x_2 = 32\}$$

$$20x_1^{-2/3}x_2^{2/5} - 5 = 0$$

$$24x_1^{1/3}x_2^{-3/5} - 12 = 0$$

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b.

$$\{x_1 = 49,\ x_2 = 32\}$$

$$70x_1^{-1/2}x_2^{2/5} - 40 = 0$$
$$56x_1^{1/2}x_2^{-3/5} - 49 = 0$$

Problem 2. Solve the following systems of equations for x_1 and x_2 first using the method of substitution and then using the method of elimination.

a.

$$\{x_1 = -1,\ x_2 = -5\}$$

$$\begin{aligned} x_1 - 3x_2 &= 14 \\ 3x_1 - 10x_2 &= 47 \end{aligned}$$

b.

$$\{x_1 = 10,\ x_2 = 3\}$$

$$\begin{aligned} 3x_1 + 16x_2 &= 78 \\ 4x_1 + 21x_2 &= 103 \end{aligned}$$

Problem 3. Solve the following system of equations for x_1, x_2, and x_3 first using the method of substitution and then using the method of elimination.

$$\{x_1 = 2,\ x_2 = 2,\ x_3 = -1\}$$

$$\begin{aligned} -x_1 + x_2 - 3x_3 &= 3 \\ 4x_1 - 5x_2 + 12x_3 &= -14 \\ 6x_1 - 2x_2 + 19x_3 &= -11 \end{aligned}$$

Elimination here

Problem 4. Find the derivatives of each of the following functions with respect to x.

a. $y = 3x^2 + 2x^4$

b. $f(x) = 3x^2 + 5e^x$

c. $f(x) = 5x^3 - 2\log[x]$

d. $f(x) = -3x^4 + 2x^3 + 3^x$

e. $f(x) = 6x^{1/2} + 9x^{1/3} - 3x^{-2}$

f. $f(x) = 4x^{-2} - 3xe^x$

g. $f(x) = 12x^{1/2} + 2x^3 \log[x]$

h. $f(x) = (3x + 2)^3$ Find in two different ways.

i. $f(x) = \frac{x^2+2x}{4x^2}$

j. $f(x) = \frac{4x^2}{x^2+2x}$

Problem 5. Find the derivatives of each of the following functions with respect to x.

a. $f(x) = (x^2 + 4x)^2$

b. $f(x) = (5x - 3)(2x + 4)$ Show two ways.

c. $f(x) = 3e^{2x^2+3x}$

d. $f(x) = 3x^2e^{2x^2+3x}$

e. $f(x) = 12^x e^{2x^2+3x}$

f. $f(x) = \log[(x^3 - 4x)^2]$

g. $f(x) = \frac{3xe^{2x}}{4x^2+2}$

h. $f(x) = \frac{3x \log[2x^2]}{x^2 + 2x}$

i. $f(x) = 2x^4 + 2xe^{3x^2}$

j. $f(x) = \frac{3x^2 e^x}{x^2+3}$

Problem 6. For each of the following, take the derivative with respect to x_1, set the derivative equal to zero and solve the resulting equation for x_1.

a. $\{x_1 = 256\}$

$$f(x) = 256x_1^{3/8} - 3x_1$$

b. $\{x_1 = \frac{81}{16}\}$

$$f(x) = 108x_1^{1/4} - 8x_1$$

c. $f(x) = 75px_1^{1/3} - 4x_1$