ECONOMICS 207
SPRING 2007
LABORATORY EXERCISE 5

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

$$\{x_1 = 81,\ x_2 = 16\}$$

$$144x_1^{-1/2}x_2^{1/4} - 32 = 0$$

$$72x_1^{1/2}x_2^{-3/4} - 81 = 0$$

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b.

$$\{x_1 = 9,\ x_2 = 1\}$$

$$15x_1^{-1/2}x_2^{2/5} - 5 = 0$$
$$12x_1^{1/2}x_2^{-3/5} - 36 = 0$$

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.

$$\{x_1 = -2,\ x_2 = -3\}$$

$$\begin{aligned} 2x_1 - 3x_2 &= 5 \\ 4x_1 + 3x_2 &= -17 \end{aligned}$$

b.

$$\{x_1 = 2,\ x_2 = 4\}$$

$$\begin{aligned} -2x_1 + 4x_2 &= 12 \\ 3x_1 + 6x_2 &= 30 \end{aligned}$$

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.

$$\{x_1 = 2,\ x_2 = -1,\ x_3 = 3\}$$

$$\begin{aligned} x_1 + 2x_2 + 6x_3 &= 18 \\ -2x_1 - 3x_2 - 10x_3 &= -31 \\ 2x_1 + 3x_2 + 11x_3 &= 34 \end{aligned}$$

Elimination here

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

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

b. $f(x) = 2x^3 + 4\,e^x$

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

d. $f(x) = -3x^2 + 12x - 4^x$

e. $f(x) = 3x^{1/2} + 12x^{1/3} - 4x^{-2}$

f. $f(x) = 4x^{-3} - 2x\,e^x$

g. $f(x) = 9x^{1/3} + 2x^2\log[x]$

h. $f(x) = (2x + 5)^3$ Find in two different ways.

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

j. $f(x) = \frac{3x^2+2x}{4x^2+5}$

k. $f(x) = -2x^4 + 2e^{2x}$

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

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

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

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

c. $f(x) = 4x\, e^{x^2+2x}$

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

e. $f(x) = x^2\, e^{2x^2-5x}$

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

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

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

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. $\{x_1 = 16\}$

$$f(x) = 128x_1^{1/4} - 4x_1$$

c. $f(x) = 32px_1^{1/4} - 4x_1$

d. $f(x) = 30x_1^{3/5}x_2^{1/5} - 6x_1 - 3x_2$