ECONOMICS 207
SPRING 2008
PROBLEM SET 5

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

$$\{x_1 = 125,\ x_2 = 32\}$$

$$100x_1^{-2/3}x_2^{3/5} - 32 = 0$$

$$180x_1^{1/3}x_2^{-2/5} - 225 = 0$$

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b.

$$\{x_1 = 729,\ x_2 = 81\}$$

$$162x_1^{-5/6}x_2^{1/4} - 2 = 0$$
$$243x_1^{1/6}x_2^{-3/4} - 27 = 0$$

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.

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

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

b.

$$\{x_1 = 1,\ x_2 = 3\}$$

$$\begin{aligned} 7x_1 + 5x_2 &= 22 \\ 3x_1 + 2x_2 &= 9 \end{aligned}$$

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.

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

$$\begin{aligned} x_1 + x_2 + x_3 &= 2 \\ 5x_1 + 6x_2 + 4x_3 &= 13 \\ 3x_1 - 2x_2 + 7x_3 &= -7 \end{aligned}$$

Elimination here

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

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

b. $f(x) = 4e^x + \frac{1}{2}x^2$

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

d. $f(x) = 2x^5 - 5x^4 + 4^x$

e. $f(x) = 15x^{1/2} + 9x^{2/3} - 18x^{1/6}$

f. $f(x) = 5x^3 - 2xe^x$

g. $f(x) = 3x^5 \log[x]$

h. $f(x) = (4x - 2)^2$ Find in two different ways.

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

j. $f(x) = \frac{6x^2-x-2}{2x^2-7x-4}$

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

a. $f(x) = (2x^2 + 3x)^3$

b. $f(x) = (6x - 5)(2x + 3)$ Show two ways.

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

d. $f(x) = 3x^2 \log[2x^2 + 3x]$

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

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

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

h. $f(x) = \frac{3xe^{2x}}{4x^{1/2}+2}$

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

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

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. $\{x_1 = 243\}$

$$f(x) = 3645x_1^{1/5} - 9x_1$$

b. $\{x_1 = 216\}$

$$f(x) = 540x_1^{1/3} - 5x_1$$

c. $\{x_1 = 256\}$

$$f(x) = 768x_1^{1/4} - 3x_1$$

Problem 7. Do the following problems from the book.

a. Section 6.2
   1) 1 (The comparison is with equation 6 in the text, not problem 6)
   2) 3
   3) 5

b. Section 6.3
   1) 1

c. Section 6.4
   1) 1
   2) 3
   3) 7

d. Section 6.5
   1) 1a
   2) 1b
   3) 1c
   4) 1d

e. Section 6.6
   1) 3a
   2) 3b
   3) 3c
   4) 3d
   5) 3e
   6) 3f
   7) 3g
   8) 3h