

ECONOMICS 207
SPRING 2008
LABORATORY EXERCISE 3

Problem 1. Solve the following equations for x .

a. $\frac{2x+5}{x+7} = \frac{19}{14}$

b. $\frac{2x-5}{11-3x} = \frac{-9}{17}$

c. $\frac{3x+4}{-13} = \frac{-8x+5}{19}$

d. $\frac{\frac{7x-12}{2x+6}}{4x-9} = \frac{1}{4}$

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Problem 2. Solve the following equations for x .

a. $3x^2 - 20x + 12 = 0$

b. $4x^2 - 27x + 18 = 0$

c. $36x^2 - 35x + 6 = 0$

d. $x^2 - \frac{13}{2}x + 10 = 0$

Problem 3. Solve the following equations for x_1 .

a. $12x_1^{-1/2} - 6 = 0$

b. $25x_1^{-2/3} - 16 = 0$

c. $4096x_1^{-3/4} - 64 = 0$

d. $343x_1^{-3/2} - 1 = 0$

Problem 4. Solve the following equations for x_1 .

a. $25x_1^{1/2} = x_1$

b. $12x_1^{1/2} = 6x_1$

c. $27x_1^{-1/3} = 3x_1^{1/6}$

d. $256x_1^{1/6} = 8x_1^{7/6}$

Problem 5. Solve the following systems of equations for x_1 and x_2 using the method of substitution
a.

$$\begin{aligned}x_1 + 2x_2 &= 7 \\7x_1 + 2x_2 &= 13\end{aligned}$$

b.

$$\begin{aligned}x_1 + 8x_2 &= 4 \\3x_1 + 2x_2 &= -10\end{aligned}$$

c.

$$2x_1 + 3x_2 = 14$$

$$6x_1 - 2x_2 = 20$$

d.

$$x_1 + 3x_2 = 7$$

$$2x_1 + 6x_2 = 12$$

e.

$$2x_1 - 3x_2 = 7$$

$$3x_1 - 5x_2 = 12$$

Problem 6. Solve the following systems of equations for x_1 , x_2 , and x_3 using the method of substitution.

a.

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

$$-2x_1 + \frac{1}{2}x_2 + 2x_3 = \frac{7}{2}$$

$$6x_1 - x_2 - 5x_3 = -7$$

$$2x_1 - 2x_2 - 4x_3 = -12$$

Solve the first equation for x_1 as a function of x_2 and x_3 as follows

$$-2x_1 = \frac{7}{2} - \frac{1}{2}x_2 - 2x_3$$

$$\Rightarrow x_1 = \frac{-7}{4} + \frac{1}{4}x_2 + x_3 \quad \text{First formula for } x_1$$

Now substitute the formula for x_1 into the second equation and get a formula for x_2 in terms of x_3 .

$$6x_1 - x_2 - 5x_3 = -7$$

$$\Rightarrow 6\left(\frac{-7}{4} + \frac{1}{4}x_2 + x_3\right) - x_2 - 5x_3 = -7$$

$$\Rightarrow \frac{-21}{2} + \frac{3}{2}x_2 + 6x_3 - x_2 - 5x_3 = -7$$

$$\Rightarrow \frac{1}{2}x_2 = -7 + \frac{21}{2} - x_3$$

$$\Rightarrow x_2 = -14 + 21 - 2x_3$$

$$= 7 - 2x_3 \quad \text{Formula for } x_2$$

Now substitute the formula for x_2 into the formula for x_1 to get a formula for x_1 that only depends on x_3 .

$$x_1 = \frac{-7}{4} + \frac{1}{4}(x_2) + x_3 \quad \text{First formula for } x_1$$

$$= \frac{-7}{4} + \frac{1}{4}(7 - 2x_3) + x_3$$

$$= \frac{1}{2}x_3 \quad \text{Second formula for } x_1$$

Now substitute the formulas for x_1 and x_2 into the third equation.

b.

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

$$x_1 + 2x_2 + 4x_3 = 8$$

$$3x_1 + 7x_2 + 10x_3 = 19$$

$$2x_1 + 3x_2 + 11x_3 = 23$$

c.

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

$$x_1 - 2x_2 + 4x_3 = -6$$

$$2x_1 - 5x_2 + 9x_3 = -15$$

$$3x_1 - 2x_2 + 7x_3 = -5$$

Problem 7. Solve the following systems of equations for x_1 and x_2 using the method of substitution.

a.

$$9x_1^{-1/2}x_2^{1/3} - 9 = 0$$

$$6x_1^{1/2}x_2^{-2/3} - 2 = 0$$

b.

$$48x_1^{-1/2}x_2^{1/4} - 32 = 0$$

$$24x_1^{1/2}x_2^{-3/4} - 9 = 0$$