

ECONOMICS 207
SPRING 2010
LABORATORY EXERCISE 9
22nd March 2010

(NOTE : Keep the lab with you to prepare for next week's exam. Turn it in on the day of the exam)

Problem 1: Differentiate each of the following with respect to x

a. $x^3 - \frac{9}{2}x^2 - 162x + 100$

b. $\frac{2}{3}x^6 + \frac{8}{5}x^5 - 15e^x + xe^k$

c. $24x - 14x^2 + x^4$

d. $3x^5 - 20x^3$

e. $20x^{1/4} - 3x^{3/5} - 2e^x$

f. $x^4 - 4x^3 + 10 \ln x + \frac{\epsilon^k m}{a}$

g. $5x^3$

h. $\ln x + 3e^x + (4x)^2$

i. $4kx^3 e^x$

j. $5ax^4 + 4b^3 \ln x + 7a$

Problem 2: Differentiate each of the following with respect to x

a. $\frac{4x}{x^2 + 4}$

b. $4xe^x$

c. $x^2 \ln x$

d. $4kx^3 e^x$

e. $\frac{4kx^3}{e^x}$

f. $kx^2e^x + \frac{\ln x}{x}$

g. $Akx^{4b} \ln x$

h. $4kx^3e^x$

i. $\frac{x^3 + e^x}{x^2 \ln x}$

j. $\frac{x^2 + 3x^2 + 4}{xe^x}$

k. $\frac{ax^3 + 3bx}{ke^k + 3c}$

l. $4kx^{-1/3}e^3$

m. $\frac{2x^2 + 3x + 3}{4x^3 + 1}$

Problem 3: Differentiate the following with respect to x

a. e^{3x}

b. e^{x^3}

c. $\ln(kx^2 + x^3)$

d. $(2x^2 + 6x - 2)^3$

e. e^{x^2-2x}

f. $e^{1/x}$

g. $y = (\ln x)^4$

h. $y = \ln x^3$

i. $y = (3kx + 4x^2)^2$

j. $y = e^{3x^2+k}$

k. $y = \ln(x^3 + kx + 4b)$

l. $y = (x^2 + \ln x)^{3k}$

Problem 4:

$$y = 6x^2 + x^4 + e^x$$

a. y' (i.e., $\frac{dy}{dx}$)

b. y'' (i.e., $\frac{d^2y}{dx^2}$, which means derivative of y')

c. y''' (which means derivative of y'')

d. y'''' (which means derivative of y''')

e. y''''' (which means derivative of y'''')

f. $y'''''(2)$ (i.e., what is the value of y''''' when $x = 2$)

Problem 5: Solve the following equations for x and y

$$70x^{-1/2}y^{2/5} - 40 = 0$$

$$56x^{1/2}y^{-3/5} - 49 = 0$$

Problem 6:

$$\begin{aligned}x - 3y &= 14 \\3x - 10y &= 47\end{aligned}$$

a. Solve the above system using **substitution**.

b. Represent the above system of equations using matrices.

c. Write down the **coefficient matrix**.

d. What is the **determinant** of the **coefficient matrix**.

e. Use **Cramer's rule** to solve the system (your answers should be the same as in part *(a)* above).

Problem 7:

$$\begin{aligned}2x - y + z &= 1 \\3x + 2y + 4z &= 11 \\-x + 3z &= 2\end{aligned}$$

a. Solve the above system using **substitution**.

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b. Represent the above system of equations using matrices.

c. Write down the **coefficient matrix**.

d. What is the **determinant** of the **coefficient matrix**.

e. Use **Cramer's rule** to solve the system (your answers should be the same as in part (*a*) above).

Problem 8:

$$2x + 2y - 2z = 6$$

$$x + 2y + 3z = 4$$

$$2x + 3y + 2z = 7$$

a. Represent the above system of equations using matrices.

b. Write down the **coefficient matrix**.

c. What is the **determinant** of the **coefficient matrix**.

d. Use **Cramer's rule** to solve the system

Problem 9:

$$A = \begin{bmatrix} 2x & 1 & 5 \\ 3 & -2 & 1 \\ 2 & 0 & 1 \end{bmatrix}; B = \begin{bmatrix} x & 2 & 6 \\ x & 4 & -2 \\ 2 & 1 & -1 \end{bmatrix}; x \geq 0$$

Let $D = AB$

a. What is d_{23} (the element in the 2^{nd} row and 3^{rd} column of matrix D)

b. Whats is d_{32}

c. Suppose $d_{11} = 20$. Find the value of x .

Problem 10: Solve the following equations

a. $\sqrt{18x^2 + 33x - 14} = 2x + 1$

$$b. 7x^{3/4} = 14x^{1/2}$$

$$c. x^{2/3} = 125x^{-1/3}$$

$$d. 6x^2 - 13x - 5 = 0$$

Problem 11: Let $A = \begin{bmatrix} 1 & 1 & 4 \\ 2 & 3 & 8 \\ 3 & 3 & 12 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$

a. A^T (transpose of A)

b. B^T (transpose of B)

c. $|A|$ (determinant of A)

d. $|B|$ (determinant of B)