

Prof. Frithjof Lutscher, University of Ottawa, MAT 1332, Winter 2009
Assignment 4, due March 11, 8:30am in class

Student Name _____ Student Number _____

DGD 1 (FTX 227) DGD 2 (CBY B012) DGD 3 (TBT 070) DGD 4 (MCD 121)

By signing below, you declare that this work was your own and that you have not copied from any other individual or other source.

Signature _____

Question 1: (4 points)

Solve the following systems of linear equations:

	$x + 3y + z = 4$		$2x + 2y - z = -5$
a)	$2x + 3y - 3z = 5$	b)	$3x + y - 3z = 3$
	$3x + 5y - 5z = 0$		$-4x + 5z = -11$

Question 2: (3 points)

Consider the system of linear equations

$$\begin{aligned}x + ay &= 2 \\ 2x + 5y &= b\end{aligned}$$

Find the values of a and b such that the system has:

- a) A unique solution.
- b) An infinite number of solutions.
- c) No solution.

Question 3: (3.5 points)

Consider the matrices

$$A = \begin{bmatrix} 3 & 1 \\ -1 & 3 \\ -2 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}, \quad C = \begin{bmatrix} -1 & 4 & 2 \\ 3 & -1 & 5 \end{bmatrix},$$
$$D = \begin{bmatrix} 1 & 4 & 2 \\ -2 & 0 & 1 \\ 3 & 2 & -1 \end{bmatrix} \text{ and } E = \begin{bmatrix} 3 & 1 & 3 \\ -1 & 1 & -1 \\ -2 & 1 & 3 \end{bmatrix}.$$

Evaluate if possible the following algebraic expressions.

a)	$2B - C$	b)	$4E - 2D$	c)	$2A^T + C$
d)	$B^T + 5C^T$	e)	$A(BC)$	f)	$E^T D^T$
g)	$(DE)^T$				

Question 4: (6 points)

For each of the matrices below, determine if the matrix is invertible and, if it is invertible, find its inverse.

$$\text{a) } A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & -2 & 0 \\ 2 & 1 & 3 \end{bmatrix} \quad \text{b) } B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & -1 \\ -1 & 1 & 4 \end{bmatrix}$$

Question 5: (6 points)

The food of laboratory mice must contain the nutrients A and B. The mice are fed two types of food. The first type contains 3 units of A and 2 units of B, and the second type contains 4 units of A and 5 units of B per gram.

- a) How many grams of each type of food must we have to get exactly 125 units of A and 100 units of B?
- b) Find the ratio between the number of grams of the two types of food if the ratio of the number of units of A over the number of units of B is 4 to 3.
- c) Can we get a ratio of 2 to 1 for the number of units of A over the number of units of B?