

University of Lethbridge
Department of Mathematics and Computer Science
MATH 1410 - Tutorial #8
Wednesday, March 14

Student #1 : _____

Student #2 : _____

Student #3 : _____

Student #4 : _____

(Moodle ID not required.)

1. For each matrix A and vector \vec{b} below, solve the equation $A\vec{x} = \vec{b}$. Express your answer in terms of the vector \vec{x} .

If there are infinitely many solutions, give your answer in the form $\vec{x} = \vec{x}_p + \vec{x}_h$, where \vec{x}_p is a particular solution, and \vec{x}_h is the general solution to the homogeneous system $A\vec{x} = \vec{0}$. (Express \vec{x}_h in terms of basic solutions.)

(a) $A = \begin{bmatrix} 1 & 0 & -4 \\ -2 & 1 & 4 \\ 1 & 0 & 6 \end{bmatrix}, \vec{b} = \begin{bmatrix} 2 \\ -1 \\ 5 \end{bmatrix}.$

(b) $A = \begin{bmatrix} 1 & 0 & 2 & -4 \\ 3 & 1 & 5 & -7 \\ -2 & -2 & -2 & -2 \end{bmatrix}, \vec{b} = \begin{bmatrix} 3 \\ 2 \\ 8 \end{bmatrix}$

2. Consider the matrices

$$A = \begin{bmatrix} 2 & -1 & 3 \\ 5 & 4 & -2 \end{bmatrix}, B = \begin{bmatrix} 4 & -2 \\ 5 & 1 \end{bmatrix}, C = \begin{bmatrix} 1 & 4 \\ -2 & -1 \\ 6 & 3 \end{bmatrix}.$$

For each of the 9 possible products ($A^2, AB, AC, BA, B^2, BC, CA, CB, C^2$), compute the product, or state why it is undefined.

3. Consider a system of equations, written in matrix form as $A\vec{x} = \vec{b}$. Prove that if there is more than one solution to the system (say, \vec{x}_1 and \vec{x}_2 , with $\vec{x}_1 \neq \vec{x}_2$), then there are infinitely many solutions.

4. For which values of k will the system
- $$\begin{array}{rcl} x + y + kz & = & 1 \\ x + ky + z & = & 1 \\ kx + y + z & = & -2 \end{array}$$
- have:

(a) No solution? (b) A unique solution? (c) Infinitely many solutions?