Math 141 - Sample Test 1
Jan 2020

Question 1:

Use Gauss-Jordan Method to solve the system

$$\begin{array}{lll} x & +y & -2z = -2 \\ 3x & -4z = 0 & \\ 3x & -4y & +3z = -5. \end{array}$$

Question 2

For the given matrices

$$A = \begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix} \quad B = \begin{bmatrix} c \\ 0 \end{bmatrix} \quad M = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 1 \end{bmatrix} \quad N = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 1 \\ 1 & 3 & 3 \\ -1 & -2 & -1 \end{bmatrix}$$

Perform (if possible!) the following computations: A^3, MA, AM, BM, NB, BN, M^TA, MN and NM.

Question 3

Determine the value of a (if any) for which the system has infinitely many solutions

$$\begin{array}{rcrcrcrcl} x_1 & - & x_2 & - & 2x_3 & + & ax_4 & = & 0 \\ x_1 & & & - & 2x_3 & + & x_4 & = & 0 \\ & & x_2 & - & 2x_3 & + & x_4 & = & 0 \\ ax_1 & + & x_2 & - & 2x_3 & & & = & 0 \end{array}$$

Question 4:

Let A and B are two 2 by 2 matrices. State the condition for AB to be a symmetric matrix.

Question 5:

Let

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 0 & 1 \\ -1 & 2 & 1 \end{bmatrix}.$$

$$B = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 1 \\ -1 & 0 & 1 \end{bmatrix}.$$

Use A and B to prove that

$$(AB)^T = A^T B^T$$

Question 6:

1. Prove/disprove the following statement: If A^2 is a symmetric matrix, then A is symmetric as well.

2. State conditions for $(A+B)^T = A^T + B^T$.

3. State conditions for $A^2 - B^2 = (A+B)(A-B)$ be a true statement.