Math 141 - Sample Test 2
Feb 2020

Question 1:

Compute the determinant

$$\begin{vmatrix} 3 & 2 & -1 & 2 \\ 1 & 0 & -1 & 2 \\ 2 & 2 & -1 & 0 \\ 3 & 2 & -1 & 2 \end{vmatrix}.$$

Question 2

Prove (disprove) that

$$|A+B| \neq |A| + |B|.$$

Hint: use two matrices

$$\begin{bmatrix} 3 & 2 \\ 1 & 0 \end{bmatrix}$$

and

$$\begin{bmatrix} -2 & 4 \\ 3 & 5 \end{bmatrix}.$$

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Question 3:

Let $\overline{u} = (1, -1, 1)$ and $\overline{v} = (2, 1, -1)$.

1. Compute

$$(\overline{u} + \overline{v}) \cdot (\overline{u} - \overline{v})$$

2. Find the angle between two vectors $\overline{u}$ and $\overline{v}$.

Question 4

Use Cramer's Rule to solve the system

$$\begin{gathered} x_1 - x_2 - 2x_3 = 1 \\ x_1 - 2x_3 = 2 \\ x_2 - 2x_3 = 0. \end{gathered}$$

Question 5:

Find A^{-1} by using two methods: the Cofactor Formula and Gauss-Jourdan algorithm.

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

Question 6

Let $\overline{u} = (3, -1, 0)$, $\overline{v} = (4, 0, 1)$ and $\overline{x} = (-2, 2, 1)$. Find two scalars α and β such that

$$\alpha\overline{u} + \beta\overline{v} = \overline{x}.$$

Question 7

Find such scalars a and b that A is a singular matrix

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

Question 8

Given three vectors $\overline{u}$, $\overline{v}$, $\overline{w}$ and a scalar α. Decide which operation is defined:

1. $\overline{u} \cdot \overline{v} \cdot \overline{w}$

2. $\overline{u} \cdot \alpha$

3.$\|\overline{u} \cdot \overline{v}\|$

4. $\|\overline{u} + \overline{v}\|$.