Linear Algebra Review

October 9, 2020

Question 1: Calculate the following norms:

1. $||x||_2$ of

$$x = \begin{bmatrix} 2 \\ 5 \\ -10 \\ -7 \\ -7 \end{bmatrix}$$

2. $||x||_1$ of

$$x = \begin{bmatrix} 2 \\ 5 \\ -10 \\ -7 \\ -7 \end{bmatrix}$$

3. $||x||_\infty$of

$$x = \begin{bmatrix} 2 \\ 5 \\ -10 \\ -7 \\ -7 \end{bmatrix}$$

4. $||X||_{fro}$ of

$$X = \begin{bmatrix} -3 & -1 & 9 \\ 8 & -6 & -4 \\ 2 & -9 & -4 \end{bmatrix}$$

Question 2: What is the rank of the following matrix:

$$X = \begin{bmatrix} 1 & -1 & 3 & 21 \\ 3 & -6 & 9 & -9 \\ 2 & -1 & 6 & 10 \\ 4 & 0 & 12 & 4 \end{bmatrix}$$

Question 3: Multiply the following two matrices (A and B):

$$A = \begin{bmatrix} 1 & -1 & 3 & 21 \\ 3 & -6 & 9 & -9 \\ 2 & -1 & 6 & 10 \end{bmatrix}$$

$$B = \begin{bmatrix} 2 & 5 & -10 \\ -7 & -7 & -3 \\ -1 & 9 & 8 \\ -6 & -4 & 2 \end{bmatrix}$$

Question 4: Given the vectors,

$$x = \begin{bmatrix} r\sin\theta\cos\psi \\ r\sin\theta\sin\psi \\ r\cos\theta \end{bmatrix}$$

$$y = \begin{bmatrix} r \\ \theta \\ \psi \end{bmatrix}$$

Compute, $\frac{dx}{dy}$