Linear Algebra Review: Solutions

October 9, 2020

Question 1: Calculate the following norms:

1. $$||x||_2 = \sqrt{\sum_i (x_i)^2}$$

2. $$||x||_1 = \sum_i |x_i|$$

3. $$||x||_\infty = max(|x_i|)$$

4. $$||X||_{fro} = \sqrt{\sum_i \sum_j (x_{ij})^2}$$

Question 3:

$$A \times B = \begin{bmatrix} \mathbf{1} & \mathbf{-1} & \mathbf{3} & \mathbf{21} \\ 3 & -6 & 9 & -9 \\ 2 & -1 & 6 & 10 \end{bmatrix}_{3\times4} \times \begin{bmatrix} \mathbf{2} & 5 & -10 \\ \mathbf{-7} & -7 & -3 \\ \mathbf{-1} & 9 & 8 \\ \mathbf{-6} & -4 & 2 \end{bmatrix}_{4\times3}$$

$$A \times B = \begin{bmatrix} (1\times2)+(-1\times-7)+(3\times-1)+(21\times-6) & \# & \# \\ \# & \# & \# \\ \# & \# & \# \end{bmatrix}_{3\times3}$$

Question 4:

$$\frac{dx}{dy} = \begin{bmatrix} \frac{dx_1}{dy_1} & \frac{dx_2}{dy_1} & \frac{dx_3}{dy_1} \\ \frac{dx_1}{dy_2} & \frac{dx_2}{dy_2} & \frac{dx_3}{dy_2} \\ \frac{dx_1}{dy_3} & \frac{dx_2}{dy_3} & \frac{dx_3}{dy_3} \end{bmatrix}$$