

Master of Science in Analytics

MSCA 37016 – Advanced Linear Algebra for Machine Learning

Instructions:

- Mark the question number and your final answer clearly (use a textbox.)
- Remember to show and explain your work (*If you can't explain it, you don't understand it.*)
- Please submit your solution through Canvas.

(4 points) Question 1:

- 1) 2% - Choose a q value which gives no solution.
- 2) 2% - Choose a q value which gives infinitely many solutions.

$$\begin{aligned}3x + 6y &= 1 \\ 6x + 12y &= q\end{aligned}$$

(7 points) Question 2:

- 1) 5% - Solve the following system of equations using Gaussian Elimination.

$$\begin{aligned}2x + 3y + z &= 12 \\ -2x + 3y - 2z &= 1 \\ x - y + 4z &= 16\end{aligned}$$

- 2) 2% Validate your answer using Python.

(4 points) Question 3:

4% - Find the rank of each of the following matrices. Verify your rank calculation using Python.

a) $A = \begin{bmatrix} 1 & 3 & 1 & 2 & 0 \\ 0 & 0 & 2 & 1 & 3 \\ 0 & 0 & 0 & 3 & 2 \\ 0 & 0 & 0 & 3 & -1 \end{bmatrix}$

b) $A = \begin{bmatrix} -1 & 1 & 0 & -1 \\ -2 & 2 & 1 & -4 \\ -1 & 1 & -2 & 3 \end{bmatrix}$