Answer the following multiple choices questions. No justification needed and you may use Python (if you want). You may put your answers on one page. Make sure your name is on your copy.

Question 1

Consider the following system of linear equations:

$$\begin{cases} x + y + z = 1 \\ x + z = 1 \\ 2y + z = 2 \end{cases}$$

The solution is

a) $x = -1$, $y = 0$, $z = z$.

b) $x = -1$, $y = 5$, $z = 4$.

c) $x = -1$, $y = 0$, $z = 2$.

d) No solution.

Question 2

Consider the following matrix:

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -1 \\ -1 & 2 & 3 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 3 & 1 \\ 1 & 0 & 1 \end{bmatrix}.$$

Then AB is equal to

a) $\begin{bmatrix} 1 & 1 & 1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$.

b) $\begin{bmatrix} 2 & 1 & 5 \\ 7 & -1 & 2 \\ 3 & 7 & 10 \end{bmatrix}$.

c) $\begin{bmatrix} 2 & 5 & 3 \\ 0 & 8 & 2 \\ 2 & 4 & 4 \end{bmatrix}$.

d) Not in the list of choices.

Question 3

Consider the matrix A from Question 2. Then the eigenvalues of A are

a) 2, $2 - i$, $2 + i$.

b) 2, -2, $2 - i$.

c) 3, $2i$, $-2i$.

d) Not in the list of choices.

Question 4

Consider the following matrix

$$A = \begin{bmatrix} 8 & -\frac{7}{2} & -3 \\ 12 & -5 & -6 \\ 8 & -4 & -2 \end{bmatrix}.$$

The change of basis P such that $P^{-1}AP$ is a diagonal matrix is

a) $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$.

b) $\begin{bmatrix} 0 & 3 & 5 \\ 3 & 1 & 3 \\ 1 & 0 & 0 \end{bmatrix}$.

c) $\begin{bmatrix} 1 & 1 & 1 \\ 2 & 0 & 2 \\ 0 & 2 & 1 \end{bmatrix}$.

d) Not in the list of choices.

Question 5

Consider the following system of ODEs:

$$Y' = \begin{bmatrix} 3 & -4 & 3 \\ -2 & 2 & 2 \\ -1 & -4 & 6 \end{bmatrix} Y.$$

Then the general solution is

a) $Y(t) = \begin{bmatrix} c_1 e^{3x} \\ c_2 e^{2x} \\ c_3 e^{6x} \end{bmatrix}$.

b) $Y(t) = \begin{bmatrix} c_1 e^{2x} + c_2 e^{4x}/3 + c_3 e^{6x} \\ c_1 e^{2x} + 2c_2 e^{4x}/3 \\ c_1 e^{2x} + c_2 e^{4x} + c_3 e^{6x} \end{bmatrix}$.

c) $Y(t) = \begin{bmatrix} c_1 e^{3x} + c_2 e^{-4x} + c_3 e^{3x} \\ c_1 e^{-2x} + c_2 e^{2x} + c_3 e^{2x} \\ c_1 e^{-x} + c_2 e^{-4x} + c_3 e^{6x} \end{bmatrix}$.

d) Not in the list of choices.