Directions:

- Work should be done neatly and on separate paper.
- Enough work must be shown so that the steps you are taking is clear.
- 1. Find the eigenvalues and eigenvectors for each of the following matrices:

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

(b) $A = \begin{bmatrix} 3 & -2 \\ -1 & 4 \end{bmatrix}$
(c) $A = \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$
(d) $A = \begin{bmatrix} 0 & 1 \\ 2 & 2 \end{bmatrix}$
(e) $A = \begin{bmatrix} 3 & 0 \\ 4 & 3 \end{bmatrix}$
(f) $A = \begin{bmatrix} 5 & 4 \\ -25 & -15 \end{bmatrix}$
(g) $A = \begin{bmatrix} 4 & 0 \\ -1 & 4 \end{bmatrix}$

2. Consider the system:

$$\bar{x}' = \left[\begin{array}{cc} 1 & 1 \\ 4 & 1 \end{array} \right] \bar{x}$$

(a) Show that the following form a fundamental pair:

$$\{\bar{x}_1, \bar{x}_2\} = \left\{ \left[\begin{array}{c} e^{3t} \\ 2e^{3t} \end{array} \right], \left[\begin{array}{c} e^{-t} \\ -2e^{-t} \end{array} \right] \right\}$$

- (b) Write down what the general solution looks like.
- (c) Solve the IVP with:

$$\bar{x}(0) = \left[\begin{array}{c} 1\\2 \end{array} \right]$$