

Answer the questions below. You may answer in the space provided. You may use the back or a separate sheet of paper if you need more space. You are to work in groups of no more than four people. Make sure to enter the names of your groupmates below.

Name: \_\_\_\_\_

Section: \_\_\_\_\_

Group Members: \_\_\_\_\_

1. Let  $A$  be a  $2 \times 2$  matrix with eigenvalues  $\lambda_1 = 2$  and  $\lambda_2 = -3$  with corresponding eigenvectors  $\mathbf{v}_1 = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$  and  $\mathbf{v}_2 = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ , respectively.

(a) (3 points) Given that  $\mathbf{x} = 2\mathbf{v}_1 + \mathbf{v}_2$ , what is  $A^3\mathbf{x}$ ? Your answer should be in the form  $\begin{bmatrix} a \\ b \end{bmatrix}$  for some  $a, b \in \mathbb{R}$ .

(b) (2 points) Give a general formula for  $A^k\mathbf{x}$  for  $k \in \mathbb{N}$ .

2. Let

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

(a) (3 points) What are the eigenvalues of  $B$ ?

(b) (2 points) Is  $B$  invertible? Why or why not?