$$A = \begin{bmatrix} 25 & 12 & 0 \\ -18 & -5 & 0 \\ 6 & 6 & 13 \end{bmatrix} \qquad \det(A - \lambda I) = \begin{bmatrix} 25-\lambda & 12 & 0 \\ -18 & -5-\lambda & 0 \\ 6 & 6 & 13-\lambda \end{bmatrix} = 0$$

$\cancel{-\lambda^3 + 33\lambda^2 - 135\lambda - 1625 + 234 - 18\lambda = 0 = -\lambda^3 + 33\lambda^2 - 153\lambda - 1391}$

~~eigen values: 13, 24.387, -4.387~~

$$(25-\lambda)(-5-\lambda)(13-\lambda) - 12(-18)(13-\lambda) = 0$$

$\boxed{\text{eigenvalues: } 7,\ 13 \text{ mult } 2}$

for $\lambda = 7$:

$$\begin{bmatrix} 18 & 12 & 0 \\ -18 & -12 & 0 \\ 6 & 6 & 6 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} 1 & 0 & -2 & 0 \\ 0 & 1 & 3 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right] \quad \begin{aligned} x_1 &= 2x_3 \\ x_2 &= -3x_3 \\ x_3 &= \alpha \end{aligned} \qquad \vec{V}_1 = \begin{bmatrix} 2 \\ -3 \\ 1 \end{bmatrix}$$

for $\lambda = 13$:

$$\begin{bmatrix} 12 & 12 & 0 \\ -18 & -18 & 0 \\ 6 & 6 & 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right] \quad \begin{aligned} x_1 &= -\alpha \\ x_2 &= \alpha \\ x_3 &= \beta \end{aligned} \qquad \vec{V}_2 = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix} = \vec{V}_3$$

$$D = \begin{bmatrix} 7 & 0 & 0 \\ 0 & 13 & 0 \\ 0 & 0 & 13 \end{bmatrix} \qquad V = \begin{bmatrix} 2 & -1 & -1 \\ -3 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$$

6. $A=\begin{bmatrix}5&1\\-4&1\end{bmatrix}$ $\quad \det(A-\lambda 1)=\begin{bmatrix}5-\lambda&1\\-4&1-\lambda\end{bmatrix}=0$

$$(5-\lambda)(1-\lambda)+4=0=\lambda^2-6\lambda+9=0$$

$\boxed{\text{eigenvalues: } 3 \text{ mult } 2}$

for $\lambda=3$:

$$\begin{bmatrix}2&1\\-4&-2\end{bmatrix}=\begin{bmatrix}0\\0\end{bmatrix}\rightarrow\left[\begin{array}{cc|c}2&1&0\\0&0&0\end{array}\right]\quad \begin{array}{l}x_1=\frac{1}{2}x_2\\x_2=\alpha\end{array}$$

$$\boxed{\vec{v}_1=\begin{bmatrix}\frac{1}{2}\\1\end{bmatrix}\quad \vec{v}_2=\begin{bmatrix}\frac{1}{2}\\1\end{bmatrix}}$$

$$\begin{bmatrix}1/2&1/2\\1&1\end{bmatrix}\begin{bmatrix}3&0\\0&3\end{bmatrix}\begin{bmatrix}\ &\ \\ \ &\ \end{bmatrix}$$

V is not invertable

7. $A=\begin{bmatrix}1&2\\-1&3\end{bmatrix}$ $\quad \det(A-\lambda 1)=\begin{bmatrix}1-\lambda&2\\-1&3-\lambda\end{bmatrix}=0$

$$(1-\lambda)(3-\lambda)+2=0=\lambda^2-4\lambda+5=0=(\lambda-5)(\lambda+1)$$

$\boxed{\text{eigen values: } 2\pm i}$

for $\lambda=-1$:

$$\begin{bmatrix}2&2\\-1&4\end{bmatrix}=\begin{bmatrix}0\\0\end{bmatrix}\rightarrow\left[\begin{array}{cc|c}1&1&0\\0&1&0\end{array}\right]\quad \begin{array}{l}x_1=-x_2=0\\x_2=0\end{array}\quad \vec{v}_1=\begin{bmatrix}0\\0\end{bmatrix}$$

for $\lambda=5$:

$$\begin{bmatrix}-4&2\\-1&-2\end{bmatrix}=\begin{bmatrix}0\\0\end{bmatrix}\rightarrow\left[\begin{array}{cc|c}-2&1&0\\0&1&0\end{array}\right]\quad \begin{array}{l}x_1=-\frac{1}{2}x_2=0\\x_2=0\end{array}\quad \vec{v}_2=\begin{bmatrix}0\\0\end{bmatrix}$$

for $\lambda=2+i$:

$$\begin{bmatrix}-1+i&2\\-1&1+i\end{bmatrix}=\begin{bmatrix}0\\0\end{bmatrix}\quad\left[\begin{array}{cc|c}-1&1+i&0\\-1+i&2&0\end{array}\right]\rightarrow\left[\begin{array}{cc|c}1&-1-i&0\\0&2-2i&0\end{array}\right]\rightarrow\left[\begin{array}{cc|c}1&0&0\\0&1&0\end{array}\right]\quad \vec{v}_1=\vec{v}_2=\begin{bmatrix}0\\0\end{bmatrix}$$

8. $A = \begin{bmatrix} -3 & 0 & -4 \\ -1 & -1 & -1 \\ 1 & 0 & 1 \end{bmatrix}$ $\det(A - \lambda I) = \begin{bmatrix} -3-\lambda & 0 & -4 \\ -1 & -1-\lambda & -1 \\ 1 & 0 & 1-\lambda \end{bmatrix} = 0$

$(-3-\lambda)(-1-\lambda)(1-\lambda) + 4(-1-\lambda) = 0$

$(3+4\lambda+\lambda^2)(1-\lambda) \rightarrow 3 + 4\lambda + \lambda^2 - 3\lambda - 12\lambda^2 - \lambda^3 - 4 - 4\lambda = 0$

$\cancel{-\lambda^3 - 11\lambda^2 \ldots - 2 = 0}$ $(x+1)^3$ $\boxed{\text{eigenvalues: } -1 \text{ mult } 3}$

for $\lambda = -1$:

$\begin{bmatrix} -2 & 0 & -4 \\ -1 & 0 & -1 \\ 1 & 0 & 2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} 1 & 0 & 2 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]$ $x_1 = -2x_3 = 0$, $x_3 = 0$, $x_2 = \alpha$

$\vec{V}_1 = \vec{V}_2 = \vec{V}_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$

V is not invertable

1.

$$A = \begin{bmatrix} 4 & 5 & 9 & -2 \\ 6 & 5 & 1 & 12 \\ 3 & 4 & 8 & -3 \end{bmatrix} \rightarrow \left[\begin{array}{cccc|c} 4 & 5 & 9 & -2 & 0 \\ 0 & -5/2 & 25/2 & 15 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array}\right]$$

$4x_1 + 5x_2 + 9x_3 - 2x_4 = 0 \quad x_1 = -\cancel{\tfrac{5}{4}x_2} - \tfrac{9}{4}x_3 + \tfrac{1}{2}x_4$

$-5/2\,x_2 + 25/2\,x_3 + 15x_4 = 0 \quad x_2 = 5/4\,x_3 + 3/2\,x_4$

$x_3 = x_3 = \alpha$

$x_4 = x_4 = \beta$

$x_1 = -\frac{25}{16}x_3 - \frac{15}{8}x_4 - \frac{36}{16}x_3 + \frac{4}{8}x_4$

$$\vec{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} -\frac{61\alpha}{16} - \frac{11\beta}{8} \\ \frac{5\alpha}{4} + \frac{3\beta}{2} \\ \alpha \\ \beta \end{bmatrix} = \alpha \begin{bmatrix} -61/16 \\ 5/4 \\ 1 \\ 0 \end{bmatrix} + \beta \begin{bmatrix} -11/8 \\ 3/2 \\ 0 \\ 1 \end{bmatrix} \quad \text{Null}(A) = \left\{ \begin{bmatrix} -61/16 \\ 5/4 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} -11/8 \\ 3/2 \\ 0 \\ 1 \end{bmatrix} \right\}$$

$$\text{Col}(A) = \left\{ \begin{bmatrix} 4 \\ 6 \\ 3 \end{bmatrix}, \begin{bmatrix} 5 \\ 5 \\ 4 \end{bmatrix} \right\} \quad \text{Row}(A) = \left\{ \begin{bmatrix} 4 \\ 5 \\ 9 \\ -2 \end{bmatrix}^T, \begin{bmatrix} 6 \\ 5 \\ 1 \\ 12 \end{bmatrix}^T \right\}$$

Rank = 2

dim Null(A) = 4 x 2

dim Col(A) = 3 x 2

dim Row(A) = 2 x 4

5.6 #18

$$\vec{x}_{k+1} = \overset{A}{\begin{bmatrix} 0 & 0 & 0.42 \\ 0.6 & 0 & 0 \\ 0 & 0.75 & 0.95 \end{bmatrix}} \overset{\vec{x}_k}{\begin{bmatrix} C_k \\ Y_k \\ A_k \end{bmatrix}}$$

3. $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ $\quad \det(A - \lambda I) = \begin{bmatrix} 2-\lambda & -1 & 1 \\ -1 & 2-\lambda & 0 \\ 0 & 0 & 2-\lambda \end{bmatrix} = 0$

$(2-\lambda)\big((2-\lambda)(2-\lambda)\big) - (-1)(-1)(2-\lambda) + 0 = 0$

$\cancel{\lambda^2 - 8\lambda + 8 - 2\lambda = 0 \to (\lambda^2 - 4\lambda + 4 - 1)(2-\lambda) = 0}$

$(\lambda^2 - 4\lambda + 4)(2-\lambda) \to \cancel{-\lambda^3 + 2\lambda^2 + 4\lambda^2 - 8\lambda + 8\lambda - 8 = -\lambda^3 + 6\lambda^2 - 8}$

$\cancel{-8\lambda - 8 = -\lambda^3 + 4\lambda^2 + 4\lambda \to -\lambda^3 + 6\lambda^2}$

$\cancel{-\lambda^3 + 6\lambda^2 - 8\lambda + 8 - 2 - \lambda = 0 = -\lambda^3 + 6\lambda^2 - 13\lambda + 6 = 0}$

$-\lambda^3 + 6\lambda^2 - 11\lambda + 6 = 0 \to (\lambda - 1)(\lambda - 2)(\lambda - 3) = 0$

$\boxed{\text{eigen values: } 1, 2, 3}$

for $\lambda = 1$: $\begin{bmatrix} 1 & -1 & 1 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \to \left[\begin{array}{ccc|c} 1 & -1 & 1 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \end{array}\right]$ $\quad x_1 = \overset{\alpha}{x_2} - \cancel{x_3}^{\,0}$, $\quad x_2 = \alpha$, $\quad x_3 = 0$

$\boxed{\vec{V}_1 = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}}$

for $\lambda = 2$: $\begin{bmatrix} 0 & -1 & 1 \\ -1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \to \left[\begin{array}{ccc|c} -1 & 0 & 0 & 0 \\ 0 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]$ $\quad x_1 = 0$, $\quad x_2 = x_3 = \alpha$, $\quad x_3 = \alpha$

$\boxed{\vec{V}_2 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}}$

for $\lambda = 3$: $\begin{bmatrix} -1 & -1 & 1 \\ -1 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix} \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \to \left[\begin{array}{ccc|c} -1 & -1 & 1 & 0 \\ 0 & 0 & -1 & 0 \\ 0 & 0 & -1 & 0 \end{array}\right]$ $\quad x_1 = -\alpha$, $\quad x_1 = -\cancel{x_2} + \cancel{x_3}^{\,0}$, $\quad x_2 = \alpha$, $\quad x_3 = 0$

$\boxed{\vec{V}_3 = \begin{bmatrix} -1 \\ 1 \\ 0 \end{bmatrix}}$

$$V = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 1 & 1 \\ 0 & 1 & 0 \end{bmatrix} \quad V^{-1} = \begin{bmatrix} 1/2 & 1/2 & -1/2 \\ 0 & 0 & 1 \\ -1/2 & 1/2 & -1/2 \end{bmatrix} \quad A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

$$\left[\begin{array}{ccc|ccc} 1 & 0 & -1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 \end{array}\right] \rightarrow \left[\begin{array}{ccc|ccc} 1 & 0 & -1 & 1 & 0 & 0 \\ 0 & 1 & 2 & -1 & 1 & 0 \\ 0 & 0 & -2 & 1 & -1 & 1 \end{array}\right] \rightarrow \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 1/2 & 1/2 & -1/2 \\ 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & -1/2 & 1/2 & -1/2 \end{array}\right]$$

$$V^{-1}A = \begin{bmatrix} 1/2 & 1/2 & -1/2 \\ 0 & 0 & 2 \\ -3/2 & 3/2 & -3/2 \end{bmatrix} \longrightarrow * V = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

4. $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & 1 \\ 0 & 0 & 2 \end{bmatrix}$ $\quad \det(A - \lambda I) = \begin{bmatrix} 1-\lambda & -1 & 1 \\ 1 & 1-\lambda & 1 \\ 0 & 0 & 2-\lambda \end{bmatrix} = 0$

$\boxed{\text{eigenvalues: } 2,\ 1 \pm i}$

$(1-\lambda)(1-\lambda)(2-\lambda) - (-1)(2-\lambda) + 0 = 0$

$-\lambda^3 + 4\lambda^2 - 5\lambda^2 + 2\lambda + 2 - \lambda = 0 \rightarrow -\lambda^3 + 4\lambda^2 - 6\lambda + 4 = 0 = (\lambda - 2)(\lambda - 1 \pm i)$

for $\lambda = 2$:

$$\begin{bmatrix} -1 & -1 & 1 \\ 1 & -1 & 1 \\ 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} 1 & 1 & -1 & 0 \\ 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right] \quad \begin{aligned} X_1 &= -X_2 + X_3 = 0 \\ X_2 &= X_3 = \alpha \\ X_3 &= \alpha \end{aligned} \quad \boxed{\vec{V}_1 = \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}}$$

for $\lambda = 1 + i$:

$$\begin{bmatrix} i & -1 & 1 \\ 1 & i & 1 \\ 0 & 0 & 1+i \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} i & -1 & 1 & 0 \\ 0 & 0 & -i & 0 \\ 0 & 0 & 1+i & 0 \end{array}\right] \rightarrow \left[\begin{array}{ccc|c} 1 & 1+i & -1+i & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 2 & 0 \end{array}\right] \quad \begin{aligned} X_1 &= (1+i)\alpha \\ X_2 &= \alpha \\ X_3 &= 0 \end{aligned} \quad \boxed{\vec{V}_2 = \begin{bmatrix} 1+i \\ 1 \\ 0 \end{bmatrix}}$$

for $\lambda = 1 - i$:

$$\begin{bmatrix} -i & -1 & 1 \\ 1 & -i & 1 \\ 0 & 0 & 1-i \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} -i & -1 & 1 & 0 \\ 0 & 0 & i & 0 \\ 0 & 0 & 1-i & 0 \end{array}\right] \rightarrow \left[\begin{array}{ccc|c} 1 & 1-i & 1+i & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 2 & 0 \end{array}\right] \quad \begin{aligned} X_1 &= (1-i)\alpha \\ X_2 &= \alpha \\ X_3 &= 0 \end{aligned} \quad \boxed{\vec{V}_3 = \begin{bmatrix} 1-i \\ 1 \\ 0 \end{bmatrix}}$$

3

$$V = \begin{bmatrix} 0 & 1+i & 1-i \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix} \quad V^{-1} = \begin{bmatrix} & & \\ & & \\ & & \end{bmatrix} \quad A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & 1 \\ 0 & 0 & 2 \end{bmatrix} \quad D = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1+i & 0 \\ 0 & 0 & 1-i \end{bmatrix}$$

$$\left[\begin{array}{ccc|ccc} 1 & 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1+i & 1+i & 0 & 0 & 1 \end{array}\right] \rightarrow \left[\begin{array}{ccc|ccc} 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & -1 & -1 & -1 & 1 & 0 \\ 0 & 1+i & 1+i & 0 & 0 & 1 \end{array}\right]$$

$$\left[\begin{array}{ccc|ccc} 1 & 1 & 1 & 1 & 0 & 0 \\ 0 & -1 & -1 & -1 & 1 & 0 \\ 0 & 0 & 0 & 1+i & -i & 1 \end{array}\right]$$

5. $A = \begin{bmatrix} 25 & 12 & 0 \\ -18 & -5 & 0 \\ 6 & 6 & 13 \end{bmatrix}$ $\det(A - \lambda I) = \begin{bmatrix} 25-\lambda & 12 & 0 \\ -18 & -5-\lambda & 0 \\ 6 & 6 & 13-\lambda \end{bmatrix} = 0$

$(25-\lambda)(-5-\lambda)(13-\lambda) + (-1)(-18)(13-\lambda) + \cancel{(-18)(6) - (6)(-5-\lambda)} = 0$

$(-125 - 25\lambda + 5\lambda + \lambda^2)$

$(\lambda^2 - 20\lambda - 125)(13-\lambda) + 234 - 18\lambda - 108 + 30 + 6\lambda = 0$

$13\lambda^2 - 260\lambda - 1625 - \lambda^3 + 20\lambda^2 + 125\lambda + 234 - 18\lambda - 108 + 30 + 6\lambda = 0$

$-\lambda^3 + 33\lambda^2 - 147\lambda - 1469 = 0 = (-x^2 + 20x + 113)(x - 13)$

eigen values: 13, −4.6, 24.6

for $\lambda = 13$:

$$\begin{bmatrix} 12 & 12 & 0 \\ -18 & -17 & 0 \\ 6 & 6 & 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right] \quad \begin{array}{l} x_1 = -x_2 = 0 \\ x_2 = 0 \\ x_3 = \alpha \end{array} \quad \vec{V}_1 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

for $\lambda = -4.6$:

$$\begin{bmatrix} 29.6 & 12 & 0 \\ -18 & -0.4 & 0 \\ 6 & 6 & 17.6 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} 148 & 0 & 0 & 0 \\ 0 & 1276 & 0 & 0 \\ 0 & 0 & 88 & 0 \end{array}\right] \quad \begin{array}{l} x_1 = 0 \\ x_2 = 0 \\ x_3 = 0 \end{array} \quad \vec{V}_2 = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

9. $A = \begin{bmatrix} 3 & -1 & 1 \\ 0 & 2 & 0 \\ 1 & -1 & 3 \end{bmatrix}$ $\det(A - \lambda I) = \begin{bmatrix} 3-\lambda & -1 & 1 \\ 0 & 2-\lambda & 0 \\ 1 & -1 & 3-\lambda \end{bmatrix} = 0$

$(3-\lambda)(3-\lambda)(2-\lambda) + \cancel{(\ldots)} + 2-\lambda = 0$

$(9-6\lambda+\lambda^2)(2-\lambda) = 18 - 12\lambda + 2\lambda^2 - 9\lambda + 6\lambda^2 - \lambda^3 + 2 - \lambda = 0$

$-\lambda^3 + 8\lambda^2 - 22\lambda + 20 = 0 = (-x^2 + 6x - 10)(x-2)$

$\boxed{\text{eigenvalues: } 2,\ 3 \pm i}$

$x = \frac{-6 \pm \sqrt{36 - 4(-1)(-10)}}{-2} = 3 \pm i$

for $\lambda = 2$:

$\begin{bmatrix} 1 & -1 & 1 \\ 0 & 0 & 0 \\ 1 & -1 & 1 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \rightarrow \left[\begin{array}{ccc|c} 1 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array}\right]$ $x_1 = x_2 - x_3$, $x_2 = \alpha$, $x_3 = \beta$

3. Values are the same, vectors are similar

V =

0.707106781186547	0.707106781186547	0
-0.707106781186547	0.707106781186547	0.707106781186547
0	0	0.707106781186548

D =

3	0	0
0	1	0
0	0	2

4. Values are the same, vectors are similar

V =

Column 1

0.707106781186547 + 0.000000000000000i

0.000000000000000 - 0.707106781186547i

0.000000000000000 + 0.000000000000000i

Column 2

0.707106781186547 + 0.000000000000000i

0.000000000000000 + 0.707106781186547i

0.000000000000000 + 0.000000000000000i

Column 3

0.000000000000000 + 0.000000000000000i

0.707106781186547 + 0.000000000000000i

0.707106781186547 + 0.000000000000000i

D =

Column 1

1.000000000000000 + 1.000000000000000i

0.000000000000000 + 0.000000000000000i

0.000000000000000 + 0.000000000000000i

Column 2

0.000000000000000 + 0.000000000000000i

1.000000000000000 - 1.000000000000000i

0.000000000000000 + 0.000000000000000i

Column 3

0.000000000000000 + 0.000000000000000i

0.000000000000000 + 0.000000000000000i

2.000000000000000 + 0.000000000000000i

5. Values are the same, most vectors are similar. Possible error on my part

V =

0	0.534522483824849	-0.707106781186547
0	-0.801783725737273	0.707106781186548
1.000000000000000	0.267261241912424	0

D =

13	0	0
0	7	0
0	0	13

6. Values are similar, vectors are slightly off. Possible error on my part

V =

Column 1

0.447213595499958 + 0.000000006664002i

-0.894427190999916 + 0.000000000000000i

Column 2

0.447213595499958 - 0.000000006664002i

-0.894427190999916 + 0.000000000000000i

D =

Column 1

3.000000000000000 + 0.000000029802322i

0.000000000000000 + 0.000000000000000i

Column 2

0.000000000000000 + 0.000000000000000i

3.000000000000000 - 0.000000029802322i

7. Values are similar, vectors are slightly off. Possible error on my part

V =

Column 1

0.816496580927726 + 0.000000000000000i

0.408248290463863 + 0.408248290463863i

Column 2

0.816496580927726 + 0.000000000000000i

0.408248290463863 - 0.408248290463863i

D =

Column 1

2.000000000000000 + 1.000000000000000i

0.000000000000000 + 0.000000000000000i

Column 2

0.000000000000000 + 0.000000000000000i

2.000000000000000 - 1.000000000000000i

8. Values are the same, vectors are similar

V =

0	-0.000000000000000	-0.000000000000000
1.000000000000000	-1.000000000000000	-1.000000000000000
0	0.000000000000000	0.000000000000000

D =

-1	0	0
0	-1	0
0	0	-1

9. Values are not similar, vectors are not similar. Possible error on my part

V =

0.707106781186547 -0.707106781186547 0.408248290463863

0	0	0.816496580927726
0.707106781186547	0.707106781186547	0.408248290463863

D =

4	0	0
0	2	0
0	0	2