FINISH FLUTTER COURSE
ON BY NEXT WEEK.

MOBILE
↳ WEEKE
lcsy

$$\det \begin{pmatrix} 4-\lambda & 8 & -1 \\ -2 & -9-\lambda & -2 \\ 0 & 10 & 5-\lambda \end{pmatrix} = 0$$

$$(4-\lambda)((-9-\lambda)(5-\lambda)+20) - 8(-10+2\lambda) + 20 = 0$$

$$-100 + 16\lambda + 4\lambda^2 + 25\lambda - 45\lambda^2 - \lambda^3 + 100 - 16\lambda = 0$$

$$0 = -\lambda^3 + 25\lambda$$

$$\lambda(-\lambda^2 + 25) = 0$$

$$-\lambda^2 = -25$$

$$\lambda_1 = 0$$

$$\lambda_2 = 5$$

$$\lambda_3 = -5$$

for $\lambda_1 = 0$; $A - 0\lambda = \begin{pmatrix} 4 & 8 & -1 \\ -2 & -9 & -2 \\ 0 & 10 & 5 \end{pmatrix}$

$$\begin{cases} 4V_1 + 8V_2 - V_3 = 0 \\ -2V_1 - 9V_2 - 2V_3 = 0 \\ 10V_2 + 5V_3 = 0 \end{cases}$$

$$10V_2 + 5V_3 = 0 \Rightarrow V_3 = -2V_2$$

into 1st eq: $4V_1 + 8V_2 - (-2V_2) = 0 \Rightarrow 4V_1 + 10V_2 = 0$

$$\Rightarrow V_1 = -\frac{5}{2}V_2$$

take V_2 as 1: $V_1 = \begin{pmatrix} -\frac{5}{2} \\ 1 \\ -2 \end{pmatrix}$

For $\lambda_2 = 5$; $A - 5\lambda = \begin{pmatrix} -1 & 8 & -1 \\ -2 & -14 & -2 \\ 0 & 10 & 0 \end{pmatrix}$

$$-V_1 + 8V_2 - V_3 = 0$$
$$-2V_1 - 14V_2 - 2V_3 = 0$$
$$10V_2 = 0 \Rightarrow V_2 = 0$$

Into First Eq: $-V_1 - V_3 = 0 \Rightarrow V_1 = -V_3$

$\lambda_2 = 5$ is:

$$\lambda_2 = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$$

for $\lambda_1 = 0$; $A - 0\lambda = \begin{pmatrix} 4 & 8 & -1 \\ -2 & -9 & -2 \\ 0 & 10 & 5 \end{pmatrix}$

$$\begin{cases} 4V_1 + 8V_2 - V_3 = 0 \\ -2V_1 - 9V_2 - 2V_3 = 0 \\ 10V_2 + 5V_3 = 0 \end{cases}$$

$10V_2 + 5V_3 = 0 \Rightarrow V_3 = -2V_2$

into 1st eq: $4V_1 + 8V_2 - (-2V_2) = 0 \Rightarrow 4V_1 + 10V_2 = 0$

$$\Rightarrow V_1 = -\frac{5}{2} V_2$$

take $V_2 = 1$: $V_1 = \begin{pmatrix} -\frac{5}{2} \\ 1 \\ -2 \end{pmatrix}$

For $\lambda_2 = 5$; $A - 5\lambda = \begin{pmatrix} -1 & 8 & -1 \\ -2 & -14 & -2 \\ 0 & 10 & 0 \end{pmatrix}$

$-V_1 + 8V_2 - V_3 = 0$

$-2V_1 - 14V_2 - 2V_3 = 0$

$10V_2 = 0 \Rightarrow V_2 = 0$

Into First Eq: $-V_1 - V_3 = 0 \Rightarrow V_1 = -V_3$

$\lambda_2 = 5$ is: $\lambda_2 = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$

For $\lambda_3 = -5$

$A + 5\lambda = \begin{pmatrix} 9 & 8 & -1 \\ -2 & -4 & -2 \\ 0 & 10 & 10 \end{pmatrix}$

$\begin{cases} 9\lambda_1 + 8\lambda_2 - \lambda_3 = 0 \\ -2\lambda_1 - 4\lambda_2 - 2\lambda_3 = 0 \\ 10\lambda_2 + 10\lambda_3 = 0 \end{cases}$

3rd Eq: $10\lambda_2 + 10\lambda_3 = 0 \Rightarrow V_2 = -V_3$

Into first Eq:

$9V_1 + 8(-V_3) - V_3 = 0 \Rightarrow 9V_1 - 9V_3 = 0$

$\Rightarrow V_1 = V_3$

$\therefore \lambda_3 = -5 \Rightarrow V_3 = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$

for $\lambda_1 = 0$; $A - 0\lambda = \begin{pmatrix} 4 & 8 & -1 \\ -2 & -9 & -2 \\ 0 & 10 & 5 \end{pmatrix}$

$\begin{cases} 4V_1 + 8V_2 - V_3 = 0 \\ -2V_1 - 9V_2 - 2V_3 = 0 \\ 10V_2 + 5V_3 = 0 \end{cases}$

$10V_2 + 5V_3 = 0 \Rightarrow V_3 = -2V_2$

into 1st eq: $4V_1 + 8V_2 - (-2V_2) = 0 \Rightarrow 4V_1 + 10V_2 = 0$

$\Rightarrow V_1 = -\frac{5}{2}V_2$

take V_2 as 1: $V_1 = \begin{pmatrix} -\frac{5}{2} \\ 1 \\ -2 \end{pmatrix}$

Final Ans: $V_1 = \begin{pmatrix} -\frac{5}{2} \\ 1 \\ -2 \end{pmatrix}$ $V_2 = \begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$ $V_3 = \begin{pmatrix} 1 \\ -1 \\ 1 \end{pmatrix}$