Quiz 14 MTH 335 Fall 2026

Sunday, November 8, 2026 9:35 AM

$$\vec{x}' = \begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}\vec{x}$$

Find e-pairs:

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

$$\lambda^2 - 1 = 0$$

$$\lambda = \pm 1$$

<u>for $\lambda = -1$</u>

$$A - \lambda I = \begin{bmatrix} 2 & 2 \\ 0 & 0 \end{bmatrix}$$

$$\rightarrow 2v_1 + 2v_2 = 0$$

$$v_1 = -v_2$$

$$\rightarrow \vec{v} = \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} v_1 \\ -v_1 \end{bmatrix} = v_1 \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$\rightarrow$ e-pair $\left\{-1, \begin{bmatrix} 1 \\ -1 \end{bmatrix}\right\}$

<u>for $\lambda = 1$</u>

$$A - \lambda I = \begin{bmatrix} 0 & 2 \\ 0 & -2 \end{bmatrix}$$

$$0v_1 + 2v_2 = 0$$

$$v_2 = 0 \quad \text{(and } v_1 \text{ is a free variable!)}$$

$$\rightarrow \vec{v} = \begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} v_1 \\ 0 \end{bmatrix} = v_1 \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$\rightarrow$ e-pair $\left\{1, \begin{bmatrix} 1 \\ 0 \end{bmatrix}\right\}$

$\Rightarrow$ system has general soln

$$\vec{x}(t) = c_1 e^{-t}\begin{bmatrix} 1 \\ -1 \end{bmatrix} + c_2 e^{t}\begin{bmatrix} 1 \\ 0 \end{bmatrix}$$