λ, 3λ

3. Consider the following matrix A:

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 1 & 0 \\ 4 & 2 & 2 \end{bmatrix}$$

For each value of λ given below determine if it is an eigenvalue of A.

a) $\lambda = 0$ NO

b) $\lambda = -1$ NO

c) $\lambda = -2$ Yes

$-\lambda^3 + 3\lambda^2 + 7\lambda - 6 = 0$

$0 + 0 + 0 - 6 \neq 0$

$-(-1)^3 + 3(-1)^2 + 7(-1) - 6 = 0$

$1 + 3 - 7 - 6 \neq 0$

$-(-2)^3 + 3(-2)^2 + 7(-2) - 6 = 0$

$8 + (12) + (-14) - 6$

$20 \quad 20$

$0 = 0$

$\det(A - \lambda I_n)$

$\det\begin{pmatrix} -\lambda & 1 & 2 \\ 1 & 1-\lambda & 0 \\ 4 & 2 & 2-\lambda \end{pmatrix}$

$(-\lambda \cdot 1-\lambda \cdot 2-\lambda) + 0 + 4 \cdot$

$(2 \cdot 4 \cdot 1-\lambda) - 0 - (2-\lambda)$

$8 \cdot 1-\lambda$

$8 - 8\lambda$

$(1-\lambda)(2-\lambda)$

$\lambda^2 - \lambda \cdot 2\lambda + 2$

$-\lambda(\lambda^2 - 3\lambda + 2)$

$-\lambda^3 + 3\lambda^2 - 2\lambda + 4 - (8 - 8\lambda)$

$-\lambda^3 + 3\lambda^2 + 6\lambda - 4 - (2-\lambda)$

$-\lambda^3 + 3\lambda^2 + 7\lambda - 6 = 0$

20/20

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20