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) $\lambda = 0$ **b)** $\lambda = -1$ **c)** $\lambda = -2$

$$\begin{bmatrix} 1 & 2 \\ 1 & 0 \\ 2 & 2 \end{bmatrix} \longrightarrow \begin{bmatrix} -\lambda & 1 & 2 \\ 1 & 1-\lambda & 0 \\ 4 & 2 & 2-\lambda \end{bmatrix} = -\lambda[(1-\lambda)(2-\lambda)] - 1[(2-\lambda+0)] + 2[2(+4-4\lambda)]$$

$1-2\lambda-\lambda+\lambda^2$

$-\lambda[\lambda^2-3\lambda+1]$

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

$(-\lambda^3+3\lambda^2-8\lambda+10)$

$\lambda^2(-\lambda+3)\ 2(-4\lambda+5)$ $-4\lambda = \frac{-5}{-4} =$

~~$\lambda=0\ \lambda=3\ \lambda=5/4$~~

$-\lambda^3+3\lambda^2-\lambda-2+\lambda+4+16-16\lambda$

$-\lambda^3+3\lambda^2\cancel{-16\lambda+14}$

$\lambda^2(-\lambda+3)$ $+7$ -6

$\lambda=0\ \lambda=3$

The roots are ~~$\lambda=0,3,5/4$~~ therefore $\lambda=0$ is an eigenvalue while $\lambda=-1$ and $\lambda=-2$ are not

$$\lambda=0 = \begin{matrix} 0 & 1 & 2 \\ 1 & 1 & 0 \\ 4 & 2 & 2 \end{matrix}$$

$$\lambda=-1 = \begin{matrix} -1 & 1 & 2 \\ 1 & 2 & 0 \\ 4 & 2 & 3 \end{matrix}$$

$$\lambda=-2 = \begin{matrix} -2 & 1 & 2 \\ 1 & 3 & 0 \\ 4 & 2 & 4 \end{matrix}$$

14/20

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