Redo

6A) $\det(A) = -x^2 + 3x - 2$

$0 = -1(x^2 - 3x + 2)$

$0 = -1(x-2)(x-1)$

6B) $x \neq \{1, 2\}$

3)
$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & 2 & 0 \\ 2 & 5 & 1 & -1 & 0 \\ 1 & 4 & -1 & 2 & 0 \\ -1 & -5 & 2 & 3 & 0 \end{array}\right]$$

$-2R_1 + R_2 \to R_2$

$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & 2 & 0 \\ 0 & 5 & -5 & -5 & 0 \\ 1 & 4 & -1 & 2 & 0 \\ -1 & 5 & 2 & 3 & 0 \end{array}\right]$$

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$-R_1 + R_3 \to R_3$

$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & 2 & 0 \\ 0 & 5 & -5 & -5 & 0 \\ 0 & 4 & -4 & -4 & 0 \\ -1 & -5 & 2 & 3 & 0 \end{array}\right]$$

$R_1 + R_4 \to R_4$

$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & 2 & 0 \\ 0 & 5 & -5 & -5 & 0 \\ 0 & 4 & -4 & -4 & 0 \\ 0 & -5 & 5 & 1 & 0 \end{array}\right]$$

$\frac{4}{5}R_2 + R_3$

$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & 2 & 0 \\ 0 & 5 & -5 & -5 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -5 & 5 & 1 & 0 \end{array}\right]$$

$R_2 + R_4 \to R_4$

$$\left[\begin{array}{cccc|c} 1 & 0 & 3 & 2 & 0 \\ 0 & 5 & -5 & -5 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -6 & 0 \end{array}\right]$$

The basis is ~~Rows columns~~ ~~1, 2, 4~~

vectors 1, 2, 4

The basis

$$\beta = \left\{ \begin{bmatrix} 1 \\ 2 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 5 \\ 4 \\ -5 \end{bmatrix}, \begin{bmatrix} 2 \\ -1 \\ -2 \\ 3 \end{bmatrix} \right\}$$

~~Q~~ 4. $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 4 & 2 \end{bmatrix}$

$-2R_1 + R_2 \to R_2$

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

$x + 2y + z = 0$

The Spanning Set $(-2\alpha - \beta, \alpha, \beta) \in \text{null}(A)$

The Spanning S

$x = -2y - z$

$y = \alpha$

$z = \beta$

$\bar{x} = \begin{bmatrix} -2\alpha - \beta \\ \alpha \\ \beta \end{bmatrix}$

$\bar{X} = \alpha\begin{bmatrix} -2 \\ 1 \\ 0 \end{bmatrix} + \beta\begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$

Vectors of this form make up the null space

2)
$$a_1\begin{bmatrix}2\\1\\3\end{bmatrix} + a_2\begin{bmatrix}-1\\2\\-5\end{bmatrix} + a_3\begin{bmatrix}1\\1\\2\end{bmatrix} = \begin{bmatrix}x\\y\\z\end{bmatrix}$$

$a_1 = \cancel{-a_2 + a_3}\ \dfrac{a_2 - a_3}{2}$

$a_2 = \cancel{-a_1 + a_3}\ \dfrac{-a_1 - a_3}{2}$

$a_3 = \dfrac{-5a_1 + 5a_2}{2}$

Basis is columns 1 → 3