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Mathematics 1553
Quiz 1
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Section HP1 / HP2
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1. Find the reduced row echelon form of the following matrix

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 6 \\ 5 & 6 & 7 & 8 \end{pmatrix}$$

Circle the pivot positions when you are done.

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 5 & 6 \\ 5 & 6 & 7 & 8 \end{pmatrix} \xrightarrow[R_3 \to R_3 - 5R_1]{R_2 \to R_2 - 3R_1} \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & -2 & -4 & -6 \\ 0 & -4 & -8 & -12 \end{pmatrix} \xrightarrow[R_3 \to R_3 - 2R_2]{R_2 \to -\frac{1}{2}R_2} \begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 2 & 3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{R_1 \to R_1 - 2R_2} \begin{pmatrix} \textcircled{1} & 0 & -1 & -2 \\ 0 & \textcircled{1} & 2 & 3 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

Pivot

Pivot

Describe the general solution to the system of equations:

$$x_1 + 2x_2 + 3x_3 = 4$$
$$3x_1 + 4x_2 + 5x_3 = 6$$
$$5x_1 + 6x_2 + 7x_3 = 8$$

Form an augmented matrix:

$$\begin{pmatrix} 1 & 2 & 3 & | & 4 \\ 3 & 4 & 5 & | & 6 \\ 5 & 6 & 7 & | & 8 \end{pmatrix}$$

from the RREF we have:

$$\begin{cases} x_1 - x_3 = -2 \\ x_2 + 2x_3 = 3 \\ x_3 \text{ is free} \end{cases}$$

So the general solution is

$$\begin{cases} x_1 = -2 + x_3 \\ x_2 = 3 - 2x_3 \\ x_3 \text{ is free} \end{cases}$$