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1. (4 pts.) Write down the augmented and coefficient matrices for the following system of linear equations. Label each appropriately, so they can be distinguished.

$$3x_2 - 7x_4 + x_5 = 0$$

$$-2x_1 - 4x_3 = 20\pi$$

$$3x_4 - 11x_5 = -6$$

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2. (6 pts.) Using complete sentences, describe the following row operations. (Don't you dare write "R" instead of "row"!!)

$R_2 \longleftrightarrow R_3$:

$R_3 \leftarrow (-3/4)R_3$:

$R_2 \leftarrow -6R_1 + R_2$:

(b) Write down the matrix that results from performing the given row operation:

$$\begin{bmatrix} 1 & -3 & 4 \\ 2 & -7 & 0 \\ 11 & 10 & 0 \end{bmatrix} \sim$$

$R_2 \longleftrightarrow R_3$

$$\begin{bmatrix} 1 & -3 & 4 \\ 2 & -7 & 0 \\ 11 & 10 & 0 \end{bmatrix} \sim$$

$R_3 \leftarrow -11R_1 + R_3$

$$\begin{bmatrix} 1 & -3 & 4 \\ 2 & -7 & 0 \\ 11 & 10 & 0 \end{bmatrix} \sim$$

$R_2 \leftarrow (1/2)R_2$

3. (6 pts.) Each of the following matrices is the augmented matrix of a system involving the variables x_1, x_2, x_3, etc. The matrices are in reduced row echelon form. Solve each system.

(a)
$$\begin{bmatrix} 1 & 0 & 0 & 0 & -3 \\ 0 & 1 & 0 & 0 & 18 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -5 \end{bmatrix}$$

(b)
$$\begin{bmatrix} 1 & -2 & 0 & 8 & 4 \\ 0 & 0 & 1 & -7 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

(c)
$$\begin{bmatrix} 1 & -2 & 0 & 8 & 0 \\ 0 & 0 & 1 & -7 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

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4. (4 pts.) Using Gauss-Jordan reduction and the required row operation notation, obtain the matrix in reduced row echelon form that is equivalent to the given 3 x 4 matrix. There is no linear system lurking in the shadows.

$$\begin{bmatrix} 3 & -6 & 0 & 0 \\ -6 & 12 & -3 & 12 \\ 1 & -2 & 1 & -4 \end{bmatrix}$$