Name _____ Quiz 2

1) Perform row operations to find a lower triangular matrix that is row equivalent to the matrix below.

$$\begin{bmatrix} 3 & 0 & 0 \\ -4 & 5 & 10 \\ 4 & 1 & 2 \end{bmatrix}$$

We perform the operation $R_2 \to R_2 - 5R_3$:

$$\begin{bmatrix} 3 & 0 & 0 \\ -24 & 0 & 0 \\ 4 & 1 & 2 \end{bmatrix}$$

2) Find the inverse of the product of matrices below. If you can express your answer as a product of matrices, do so. If you're unable to do so, you will probably run out of time on this quiz before you're done multiplying and row reducing.

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & -3 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1/5 \end{bmatrix}\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Notice that this is a product of elementary matrices, which are easy to invert themselves. Also recall that the inverse of a product AB is the product of the inverses $B^{-1}A^{-1}$. Applying these two ideas we get:

$$\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 5 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 3 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1/2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$