Name:

1. Compute entry a_{23} of

$$A = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 3 & -2 \\ 4 & 0 & 5 \end{bmatrix} \begin{bmatrix} 2 & 1 & -1 \\ 3 & -2 & 4 \\ 7 & 2 & 1 \end{bmatrix}.$$

$(-1, 3, -2) \cdot (-1, 4, 1) = 1 + 12 - 2 = 11$

2. Use elimination and back substitution to solve the system

$$\begin{bmatrix} 2 & -1 & 1 \\ 4 & 1 & -2 \\ 0 & -3 & 9 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 9 \\ -6 \end{bmatrix}.$$

$$\begin{bmatrix} 2 & -1 & 1 & 4 \\ 4 & 1 & -2 & 9 \\ 0 & -3 & 9 & -6 \end{bmatrix} \rightsquigarrow \begin{bmatrix} 2 & -1 & 1 & 4 \\ 0 & 3 & -4 & 1 \\ 0 & -3 & 9 & -6 \end{bmatrix} \rightsquigarrow \begin{bmatrix} 2 & -1 & 1 & 4 \\ 0 & 3 & -4 & 1 \\ 0 & 0 & 5 & -5 \end{bmatrix}$$

$5z = -5 \Rightarrow z = -1$

$3y - 4z = 1$

$3y + 4 = 1$

$y = -1$

$2x - y + z = 4$

$2x + 1 - 1 = 4$

$x = 2$

3. In class we discussed that in general $AB \neq BA$. Nevertheless,

$$E_{21}(-1)E_{31}(4) = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ -4 & 0 & 1 \end{bmatrix} = E_{31}(4)E_{21}(-1).$$

Explain briefly in terms of row operations why you would expect that the order of multiplication does not matter in this case.

E_{21} is an elimination matrix that ads copies of row 1 to row 2

E_{31} is an elimination matrix that adds copies of row 1 to row 3

These two operations commute. The order is irrelevant.