Linear Algebra (MT-1004)

Homework#7

Question 1

Let S be the parallelopiped determined by the vectors

$$\mathbf{b_1} = \begin{bmatrix} -5 \\ 1 \\ 0 \end{bmatrix}, \mathbf{b_2} = \begin{bmatrix} -2 \\ 5 \\ 0 \end{bmatrix}, \mathbf{b_3} = \begin{bmatrix} -2 \\ -5 \\ 4 \end{bmatrix}$$

and let

$$A = \begin{bmatrix} 1 & 0 & 0 \\ -3 & 2 & 0 \\ 1 & 1 & 3 \end{bmatrix}$$

Compute the volume of the image of S under the mapping $\mathbf{x} \to \mathbf{Ax}$.

Question 2

By what factor does the following transformation change the size of the box?

$$T \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} x - y \\ 2x + y \end{bmatrix}$$

Question 3

Find the inverse of

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 7 & 5 & 4 \\ 8 & 7 & 10 \end{bmatrix}$$

by using:

1. Cofactor Expansion method
2. Row operation
3. Also write A and A^{-1} as product of elementary matrices (Note that you can use elementary row operations done in last part to construct these elementary matrices)