CS444 Linear Algebra Exercises

1. Assuming that

$$
B = \begin{bmatrix} 1 & 2 & -3 \\ 3 & 4 & -1 \end{bmatrix}, \quad
A = \begin{bmatrix} 2 & -5 & 1 \\ 1 & 4 & 5 \\ 2 & -1 & 6 \end{bmatrix}, \quad
y = \begin{bmatrix} 2 \\ -4 \\ 1 \end{bmatrix}, \quad
z = \begin{bmatrix} -15 \\ -8 \\ -22 \end{bmatrix}
$$

calculate each of the following by hand:

- BA

- AB^T

- Ay

- $y^T z$ (This is the inner product, or dot product, of y and z.)

- yz^T (This is the outer product of y and z.)

2. Given that $A = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$, and $b = \begin{bmatrix} 4 \\ 6 \end{bmatrix}$

- Find A^{-1}. (Hint: let $B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and solve $AB = I$ for a, b, c and d.)
  Check your answer by computing AA^{-1}.

- Use A^{-1} to solve $Ax = b$ for x.
  Check your answer by computing Ax.