CS444 Numpy Exercises

1. Download the file `numpy_exercises.py`. At the top of that file instantiate numpy arrays representing each of the following:

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

   provide numpy code that calculates and prints each of the quantities below.

   - 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. Complete the following exercises using numpy. All answers should be in `numpy_exercises.py`.

   - Solve $Ax = z$ for x. (The command for matrix inverse in numpy is `np.linalg.inv()`.)
   - Create a loop that uses array slicing to print each of the rows of A to a separate line.
   - Create a loop that uses array slicing to print each of the columns of A to a separate line.

3. Complete the `normalize` function declared in `numpy_exercises.py`. This function should take a numpy array of any shape or size, and return a normalized version in which the entire array has been rescaled so that all entries are in the range $[0, 1]$. YOUR FUNCTION SHOULD USE NO LOOPS. Use only numpy array operations.

   - Use `normalize` to calculate a normalized version of y.
   - Use `normalize` to calculate a normalized version of B.