CS444 Numpy Exercises

1. If you haven't already, download the Brief introduction to numpy arrays. Type (or copy and paste) each line of numpy code into a Python interpreter window as you read the tutorial.

2. Download the file `numpy_exercises.py`. At the top of the `main` method 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.)

3. Complete the function `solve_for_x(A, z)` so that it matches the documenation. Test your function by uncommenting the appropriate lines in `main`. (The command for matrix inverse in numpy is `np.linalg.inv()`.)

4. Complete the functions `print_rows` and `print_cols`. each method should use array slicing to print each row (or column) to a separate line. Test your functions by uncommenting the appropriate lines in `main`.

5. Complete the function `squared_error(X, w, y)`. This function should return the quantity:

$$\sum_{\mathbf{x}_i \in \mathbf{X}} (\mathbf{x}_i \mathbf{w}^T - y_i)^2$$

   Add code to your main to test the completed function.

6. If you have time: add a new method with the signature `squared_error_fast(X, w, y)`. This method should compute the same value as `squared_error`, but it should do so without using any loops.