CS444 HW #6

This homework has both a written and a programming component. Written solutions may be completed by hand, and submitted at the beginning of class on the due date. Python files for the programming questions should be submitted through Blackboard.

1. Calculate the partial derivatives of $f(x, y) = \sqrt{x^2 + y^2}$. Show your work.

For the next two questions, assume that

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

2. For each of the following exercises, solve the problem by hand *and* provide Python code in the file `linalg_hw6.py` for solving the problem using numpy.

   - Calculate BA
   - Calculate AB^T
   - Calculate Ay
   - Calculate $y^T z$ (This is the same as $y \cdot z$)
   - Calculate yz^T

3. Complete the following. You don't need to do these exercises by hand. All answers should be in `linalg_hw6.py`.

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

4. Complete the function `train_logistic` in the file `logistic_regression.py`. Use your functions to find weights for AND, and OR classification tasks. What happens when you try learn XOR? Hand in your completed file, as well as a description (or plots) of the results.