Linear algebra

1. Given matrices **A** and **B** calculate(if possible) the following operations.

$$\mathbf{A} = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ 3 & 1 \end{bmatrix} \mathbf{B} = \begin{bmatrix} 0 & 0 & 1 \\ 4 & 5 & 2 \end{bmatrix}$$

   (a) A +B
   (b) 2A
   (c) AB
   (d) BA^T
   (e) $A + B^T$
   (f) Ax where $x = \begin{bmatrix} 1 \\ 2 \end{bmatrix}$

2. Given vectors **a** =[2, 3, 10] and **b**=[1, 0, 1] calculate:

   (a) dot product of vectors
   (b) unit vector of vector **a** and vector **b**
   (c) cosine of angles between vectors

3. For the following metrics check if metrics conditions are satisfied. Find distances between points A(3,2) B(7,8):

   (a) euclidean
   (b) taxicab
   (c) maximum
   (d) and Levenshtein distance between 'kitten' and 'kitchen'

Calculus

4. Find partial derivatives f_x and f_y if f(x,y) is given by
   $f(x, y) = xy^2 + 2xy + y$
   Find gradient $\nabla f(x, y)$.

Probability

5. A fair die is rolled three times, what is the probability that a 6 occurs on at least one roll?

6. A fair die is rolled. What is the probability that the roll is 5 given that the roll is odd?