Homework #1

1. k-NN: Classification

X is three-dimensional. X belongs to one of four classes as follows:

- Class A : (7, 8, 200), (8, 9, 220), (6, 6, 180), (7.5, 8.5, 210), (6.5, 7, 190)
- Class B : (5, 5, 100), (5.5, 4.5, 120), (6, 5, 130), (5, 6, 110), (5.5, 5, 115)
- Class C: (2, 2, 50), (2.5, 2.5, 55), (1.5, 2, 45), (2, 2.5, 52), (3, 2, 58)
- Class D: (10, 3, 120), (12, 3.1, 110), (11, 2.9, 130), (14, 3, 120), (15, 2.6, 110)

A new sample X = (8,9,111) is given. Determine its class with k-NN

a) Use k = 3 and L2 Distance

b) Use k = 5 and L2 Distance

c) Use weight-base k-NN. k = 3 and weight is $w(x) = \exp(-dist(x, x'))$

d) Use weight-base k-NN. k = 5 and weight is $w(x) = \exp(-dist(x, x'))$

e) Let X=(a,b,c). Which factor in (a, b, c) would predominantly affect the class determination?

2. k-NN: Regression

We want to predict the Price using Age, Horse_Power, Brand and MPG using k-NN.
A new sample is (6, 200, 5, 30). Make a prediction on its Price.

a) k=3

b) k=5

c) Use weight-based k-NN. k=3, $w(x) = \exp(-dist(x, x'))$

d) Use weight-based k-NN. k=5, $w(x) = \exp(-dist(x, x'))$

id	Age	Horse_Power	Brand	MPG	Price
Car 1	2	200	4	27	30,000
Car 2	5	150	3	35	20,000
Car 3	3	180	4	25	25,000
Car 4	1	230	2	10	21,000
Car 5	5	180	5	40	38,000
Car 6	4	210	3	30	31,000