K-NN Homework

X	Y	class label	Regression label	
.3	.8	A	.6	(2nd)
-.3	1.6	B	-.3	X
.9	0	B	.8	(1st)
1	1	A	1.2	(3rd)

Q = (.5, .2) 3-NN

1) $|.5-.3|+|.2-.8| = .2+.6 = .8$ (A) 2nd closest
$|.5-(-.3)|+|.2-1.6| = .8+1.4 = 2.2$ (B) X
$|.5-.9|+|.2-0| = .4+.2 = .6$ (B) 1st closest
$|.5-1|+|.2-1| = .5+.8 = 1.3$ (A) 3rd Closest

Q would be class **A** with no weighting (2 votes A, 1 vote B)

2) Low weighting

$B = \frac{1}{.6^2} = 2.78$

$A = \frac{1}{(.8)^2} + \frac{1}{1.3^2} = 1.5625 + .591 = 2.154$

B wins since $2.78 > 2.154$

3)

$$\hat{f}(Q) = \left(\frac{\frac{0}{(.6)^2} + \frac{.8}{.8^2} + \frac{1}{1.3^2}}{\frac{1}{.6^2} + \frac{1}{.8^2} + \frac{1}{1.3^2}} \right) = \left(\frac{0 + 1.25 + .591716}{2.78 + 1.5625 + .591716} \right)$$

$$= \frac{1.842}{4.932} = \boxed{0.373}$$