1. What is the magnitude of w = [0.5, 0.5]?

|w| = (0.5^2 + 0.5^2)^0.5 = 0.707

2. Multiple the following two vectors (x * w), where x = [0.5, 0.5] and w = [0. 75, 1.25]

0.5*0.75 + 0.5*1.25 = 0.375 + 0.625 = 1

3. Multiple the following two vectors (tl'*W) using the vectors from the previous problem.

[0.5*0.75, 0.5*1.25
 0.5*0.75, 0.5*1.25]
=
[0.375, 0.625,
 0.375, 0.625]

4. What is the dot product of x and w using the values from the previous problem?

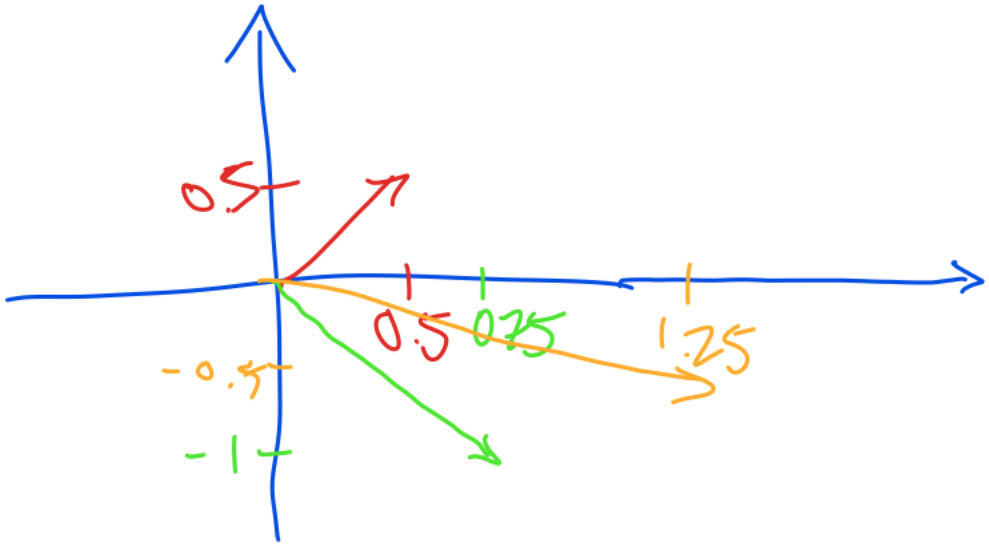
0.5*0.75 + 0.5*1.25 = 0.375 + 0.625 = 1

5. What is the angle between x and w using the values from the previous prob□lem? Draw the vectors and label the angle that you found.

x . w = 1
|x| = 0.707
|w| = (0.75^2+1.25^2)^0.5 = 1.4577
cos(p) = 1 / (0.707*1.4577) = 0.9703
p = cos_inv(0.9703) = 14 degrees

6. Add the following vectors, and draw the resultant and the original vectors. x = [0.5, 0.5] and w = [0. 75, -1]

x + w = [0.5+0.75, 0.5-1] = [1.25, -0.5]



7. What is the difference between prediction and classification?

Prediction refers to determining a continuous numerical output from some data. Classification, however, produces a more discrete answer by deciding whether some input data belongs to one of two or more classes.

8. Using the perceptron learning algorithm and a single neuron, find the weights that correctly predict the "OR" function. Continue updating the weights using the algorithm discussed in class until you converge on a correct solution. Show all of your work. The initial weights are w0 = 0, w1 = 0.5, w2 = -0.5 and the learning parameter v = 0.25. You may also assume that x0 = 1.

X1 X2 OR

0 0 0

0 1 1

1 0 1

1 1 1

y = -1*w0 + x1*w1 + x2*w2
L = (y-t)^2dy/dw = [-1, x1, x2]
dL/dwk = 2(y-t)*[-1,x1,x2]

w0	0											
w1	0.5											
w2	-0.5					dL/dw = 2(y-t)*[1,x1,x2]			wN = w - vdL/dw			
	x1	x2	t = OR	y = w0 + x1*w1 + x2*w2	L(w) = (y-t)^2	dL/dw0	dL/dw1	dL/dw2	w0	w1	w2	
	0	0	0	0	0	0	0	0	0	0	0	
	0	1	1	0	1	-2	0	-2	0.5	0	0.5	
	1	0	1	1	0	0	0	0	0.5	0	0.5	
	1	1	1	1	0	0	0	0	0.5	0	0.5	
	0	0	0	1	1	2	0	0	0	0	0.5	
	0	1	1	1	0	0	0	0	0	0	0.5	
	1	0	1	0	1	-2	-2	0	0.5	0.5	0.5	
	1	1	1	1	0	0	0	0	0.5	0.5	0.5	
	0	0	0	1	1	2	0	0	0	0.5	0.5	
	0	1	1	1	0	0	0	0	0	0.5	0.5	
	1	0	1	1	0	0	0	0	0	0.5	0.5	
	1	1	1	1	0	0	0	0	0	0.5	0.5	
	0	0	0	0	**0**	0	0	0	0	0.5	0.5	
	0	1	1	1	**0**	0	0	0	0	0.5	0.5	
	1	0	1	1	**0**	0	0	0	0	0.5	0.5	
	1	1	1	1	**0**	0	0	0	0	0.5	0.5	

w0 = 0, w1 = 0.5, w2 = 0.5