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UW Madison
CS 760, Fall 2014
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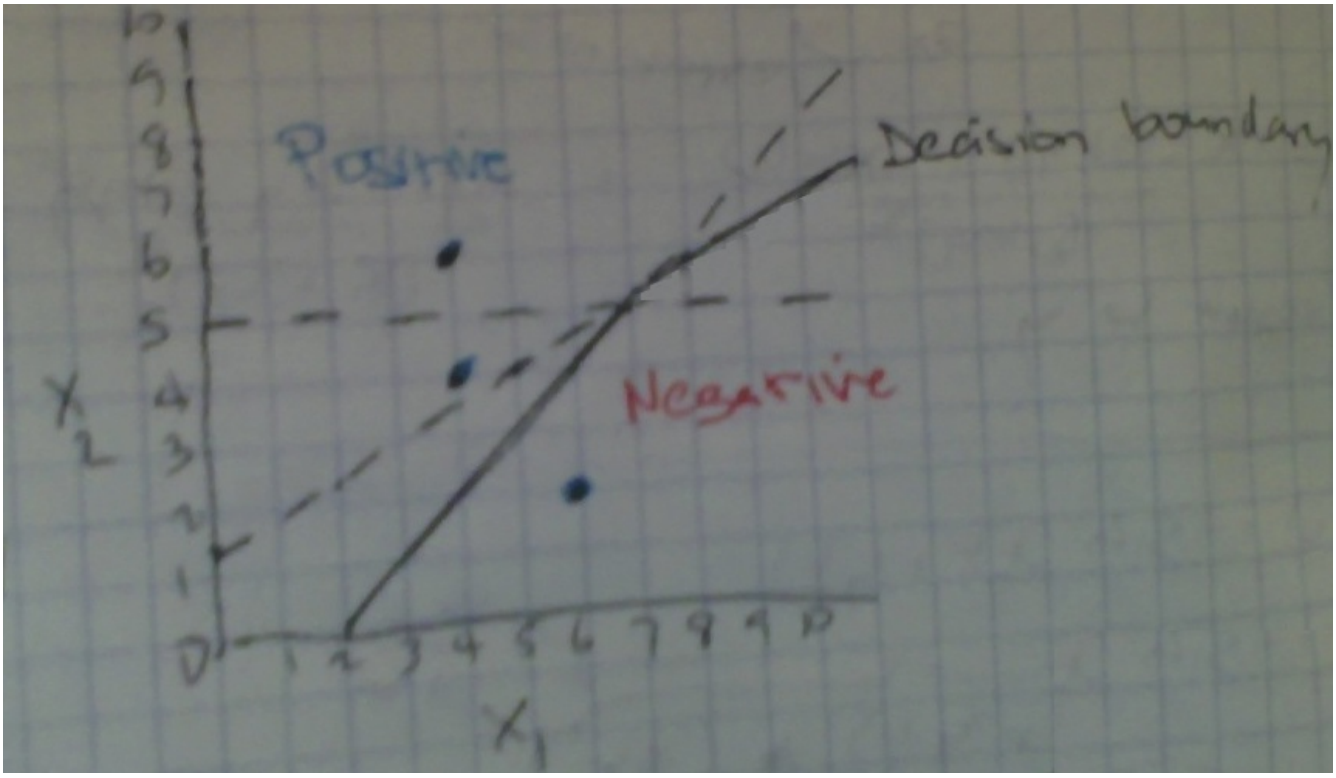
Homework 2

Question1:



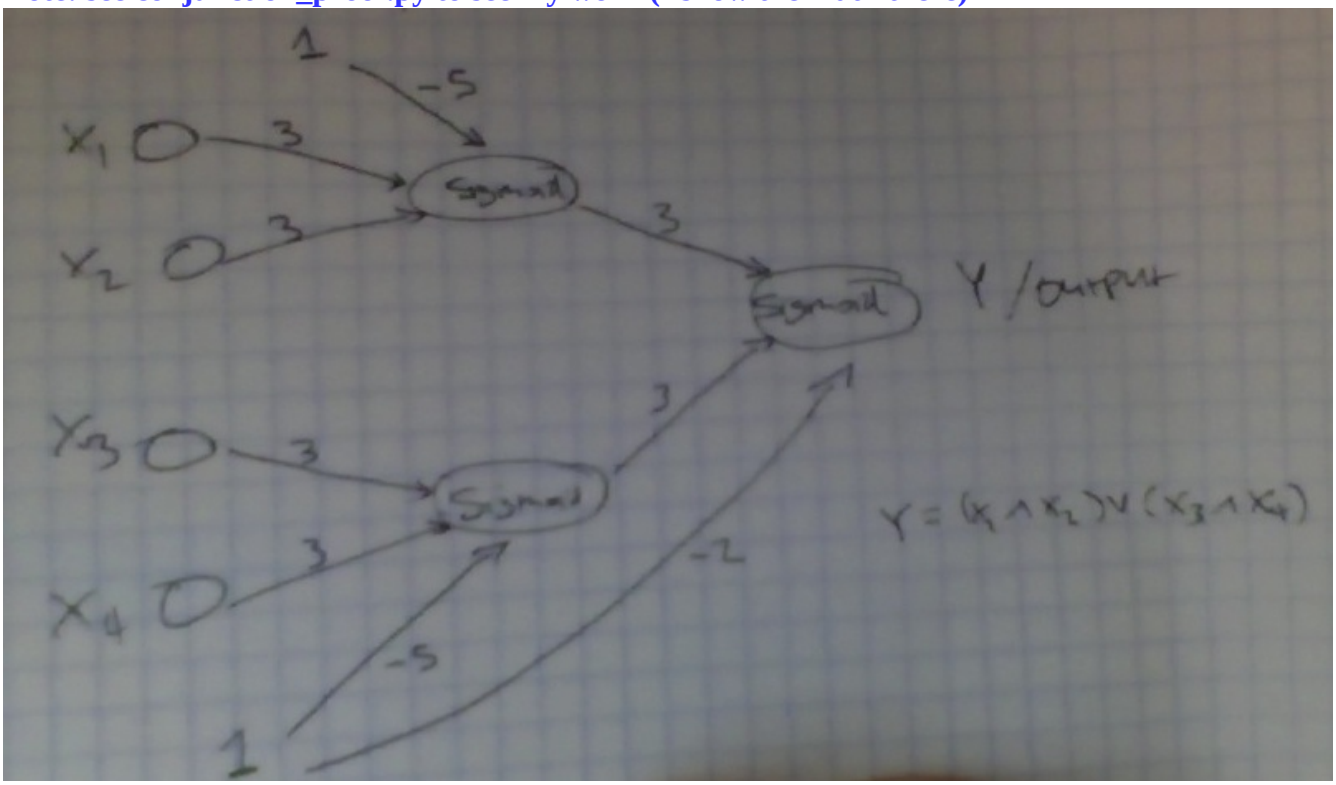
Question2:

Question 2:					**instance: x(q)=(7,10)**
	distance	**best distance**	**best node**	**priority queue**	
		infinity		(f,0)	
pop f	7.07106781186548	7.07106781186548	f	(h,0) (c,1)	
pop h	7.07106781186548	7.07106781186548	f	(i,0) (c,1) (g,5)	
pop i	3	3	i	(c,1) (j,3) (g,5)	
pop c	2	2	c	(j,3) (g,5)	
pop j	return c				

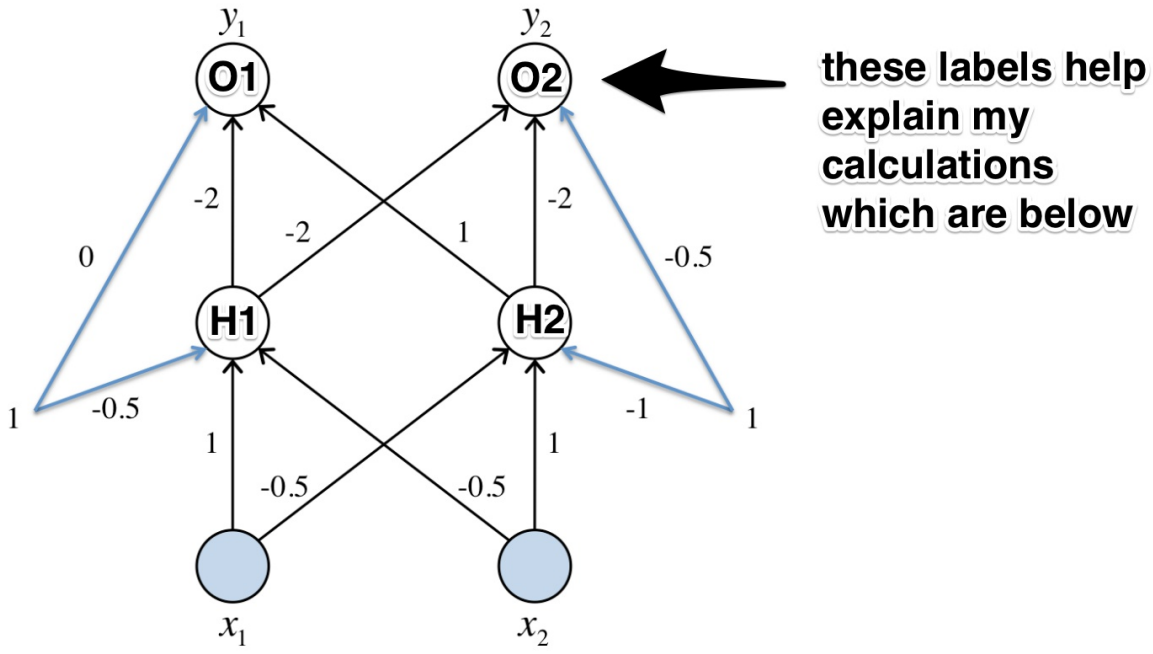
Question 3:

Most weights are 3. Hidden unit bias are both -5, and output unit bias is -2

Note: see conjunction_proof.py to see my work (I show the math there)



Question 4



training instance: $x = [0, 1]$ $y = [1, 0]$

Question 4 continued:

Note: if you want to see more of my work, look at backpropagation_calc.py

Question 4:	
calculate hidden outputs	**explanation:**
h1:0.26894142137	h1 = hidden unit (in front of x1)
h2:0.5	h2 = hidden unit (in front of x2)
calculate outputs	o2 = output of unit y2
o1:0.490530421778	
o2:0.115282490258	
calculate output unit errors	
o1_delta:0.127321708935	
o2_delta:-0.0117579422053	
calculate hidden unit errors	
h1_delta:-0.0454424311787	
h2_delta:0.0377093983364	
calculate weight changes	
weight_delta_o1_h1: 0.003424	
weight_delta_o1_h2: 0.006366	
weight_delta_bias_o1: 0.012732	
weight_delta_o2_h1: -0.000316	
weight_delta_o2_h2: -0.000588	
weight_delta_bias_o2: -0.001176	
weight_delta_h1_x1: -0.000000	
weight_delta_h1_x2: -0.004544	
weight_delta_bias_h1: -0.004544	
weight_delta_h2_x1: 0.000000	
weight_delta_h2_x2: 0.003771	
weight_delta_bias_h2: 0.003771	

Question 5

Test Set

Number Ep	Average Accura
1	57.88%
10	74.50%
100	77.40%
1000	80.26%

Training Set

Number Ep	Average Accura
1	61.72%
10	79.66%
100	85.51%
1000	90.60%

Question 6

FPR	TPR
0.00	0.00
0.00	0.07
0.01	0.13
0.02	0.23
0.03	0.23
0.05	0.26
0.07	0.38
0.08	0.41
0.09	0.50
0.10	0.56
0.12	0.58
0.14	0.61
0.15	0.62
0.16	0.63
0.18	0.67
0.19	0.75
0.22	0.78
0.23	0.80
0.24	0.82
0.26	0.85
0.28	0.86
0.29	0.86
0.30	0.88
0.33	0.89
0.35	0.90
0.36	0.91
0.38	0.93
0.42	0.95
0.44	0.96
0.47	0.97
0.55	0.98
0.59	0.99