**Keshav Balasubramanian**

**kb6bf**

**CS4710: Artificial Intelligence Midterm 3**

**Pledge :** On my honor as a student I have neither given nor received aid on this test

Keshav Balasubramanian

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Exercise 1**

1. True
2. False
3. False
4. False
5. True

**Exercise 2**

P (W | C) = P (W, C) / P(C)

P (W, C) = ∑ (over S, R) P(C, S, R, W)

P (C, S, R, W) = P(C) P(S | C) P(R | C) P(W | S,R)

Since we want P(W=T | C=T) we known P(C) = 0.5 and also we can break up the sum ∑(over S, R) P(C)P(S | C)P(R | C)P(W | S,R) into the sum of 4 terms corresponding to the cases: (W=T, S=T, R=T), (W=T, S=T, R=F), (W=T, S=F, R=T), (W=T, S=F, R=F).

We can infer all the terms from the conditional probability tables:

Hence P (W=T | C=T) = ((0.5)(0.2)(0.7)(0.99) + (0.5)(0.2)(0.3)(0.9) + (0.5)(0.8)(0.7)(0.9) + (0.5)(0.8)(0.3)(0))/(0.5) = **0.6966**

**Exercise 3**

hΘ(x) = Θ0 + Θ1x + Θ2x2

Since we have only one explanatory variable m = 1.

Hence J(Θ) = [Θ0 + Θ1x + Θ2x2– y]2.

To find the update rule with respect to Θ2we differentiate hΘ(x) w.r.t Θ2.

Hence

dJ(Θ) /dΘ2 = 2[Θ0 + Θ1x + Θ2x2– y]x2

→ dJ(Θ) /dΘ2 = 2x2 [hΘ(x) – y].

Therefore, the update rule for Θ2 is:

**Θ2 = Θ2 - 2αx2[hΘ(x) – y].**

**Exercise 4**

1. is the transition probability matrix T.
2. Since V0 = [1, 0, 0, 0], V3 = T3V0.
3. Hence V3 = (1, 0, 0, 0) =