**760 HW1: Akash Sharma**

1. Read the course webpage at http://pages.cs.wisc.edu/∼jerryzhu/cs760.html and answer the following questions:

* Where do we post announcements and clarifications?

Ans. Piazza

* What time of day (hour:minute) are all homeworks due?

Ans. 10:59 AM

* Will late homework be accepted?

Ans. No, late homework will not be accepted.

* Tom received the following scores on his 7 homeworks: 0, 59, 92, 95, 98, 100, 100. According to the homework policies, what is Tom’s final average homework score?

Ans. Lowest score 0 will be dropped from final average calculation. Final average is **90.67.**

* How can you discuss homework questions with fellow students while avoiding the impression of cheating?

Ans. We can discuss the homework approaches and techniques broadly with other fellow students. However, all examinations, programming assignments, and written homeworks must be written up individually.   
  
Also, for programming assignments the code must not be developed in groups, nor should code be shared. We need to make sure to work independently on all the problems and write our own final writeups.

1. Consider the matrix X and the vectors y and z below:
2. Computer yT X z

Ans.

yT = (2 3)

z = 7

6

yT X z = 2\*7 + 3\*6 = 32

1. Is X invertible? If so, give the inverse, and if no, explain why not.

Ans. Yes, X is Invertible as its determinant is non-zero. The determinant is: 6\*9 – 7\*8 = 54 – 56 = -2.

Inverse of X = -4.5 3.5

4 -3

1. Partial derivative of the above expression is:

ex + 6ztan(z)x6z-1 + 4/x – 7/(7x+2)

1. Probability & statistics:
2. 0.3 \* 0.7 \* 0.7 \* 0.3 \* 0.7 \* 0.7 \* 0.7 = 0.0151263
3. **CHECK THIS ONCE**
4. P (A = 0|B = 1) = 0.3/0.4 = ¾ = 0.75
5. What is P (A = 0 ∨ B = 0) = 0.9
6. Big Oh Notation:

f(n) = O(g(n)) if there exists a positive integer n0 and a positive constant c, such that f(n) ≤ c.g(n) ∀ n≥n0

* 1. f(n) = n/2, g(n) = log2 (n)

Ans. f(n) is the running time complexity in terms of the input size. Now, here log2(n) <= c(n/2) ∀ n≥4, that is g(n) = O(f(n)).

* 1. **f(n) = ln(n), g(n) = log2 (n)**

Ans. Since, loga(b) = logxb/ logxa, therefore,

f(n) = ln(n) = log2n / log2e, hence, f(n) = O(g(n)) as log2e > 1.

* 1. **f(n) = n pow 100, g(n) = 100 pow n**

Ans.

* 1. Probability:

1. For any A, B ⊆ Ω, P(A|B) P(B) = P(B|A) P(A).

Ans. **TRUE**

P(A|B) P(B) = (P (A∩ B) / P(B)) \* P(B) = P (A∩ B)

P(B|A) P(A) = (P (A∩ B) / P(A)) \* P(A) = P (A∩ B)

1. For any A, B ⊆ Ω, P(A ∪ B) = P(A) + P(B) − P(A|B).

Ans. **TRUE**

We can prove using Venn Diagram.

1. **For any A, B, C ⊆ Ω such that P (B ∪ C) > 0,**

P (A∪B∪C) / P (B∪C) ≥ P (A|B ∪ C) P (B ∪ C)

Ans. Right Side = P (A|B ∪ C) P (B ∪ C) = P(A ∩ B U C) Left Side = (P(A) + P(B U C) – P(A ∩ B U C))

1. **TRUE**
2. **FALSE**

6.2

1. Laplace: h
2. **Multinomial**
3. Poisson: l
4. Dirichlet: k
5. Gamma: j

6.3

1. n\*p
2. n \* p \* (1 - p)