

Student Name:

Homework # 2

Instructions: Prepare your deliverables in clean letter size printer-quality papers with a high-contrast pencil (engineering pads are also accepted). Attach this assignment sheet as cover page, show all your work, and box all your solutions. All Matlab code needs to be published, and all figures needs to have proper axis labeling and legends. Homework assignments will be collected during class time on the due date. *No late homework or submission that do not strictly follow the provided instructions will not be accepted.*

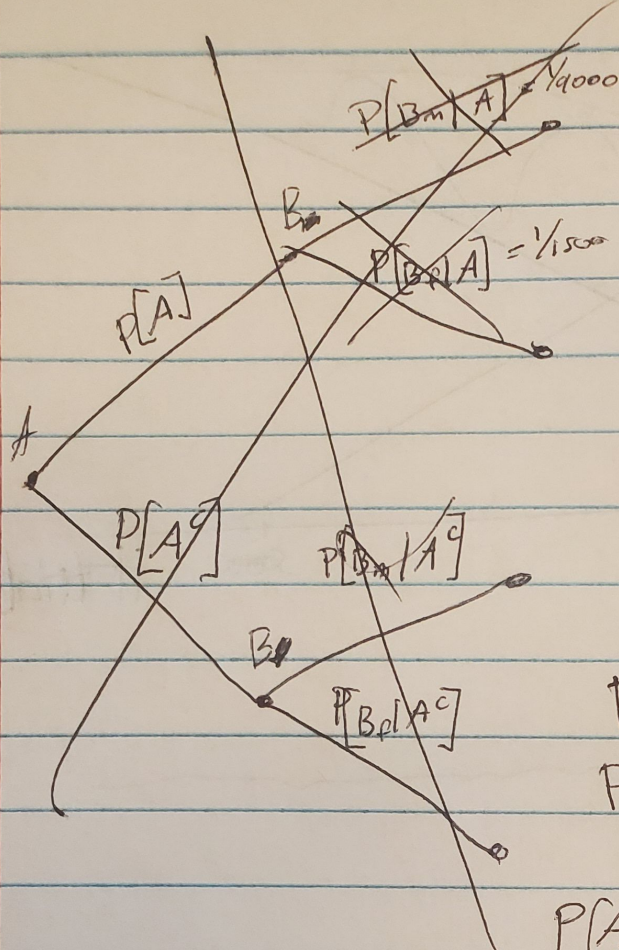
- **Homework problems not to be graded**

- From textbook (Lathi):
 - Ch 1: 4.2, 4.8, 5.1, 6.2, 6.7

- **Homework problems to be graded**

Consider a sample population group with equal number of male and female. In this population, 1 male in 9,000 contracts tuberculosis and 1 female in 15,000 contracts tuberculosis. Answer the following:

- a) What is the probability that a subject in the sample population will contract tuberculosis? (Hint: use the law of total probability with events $A = \{\text{subject contracts tuberculosis}\}$, $B_m = \{\text{subject is male}\}$, $B_f = \{\text{subject is female}\}$)
- b) Given that a person contracted tuberculosis, what is the probability that the subject is male?
- c) Are the events A and B_m independent? Show your work to justify your answer



~~$P[B_m|A] = 1/4000$~~

$P[B_m^c] = P[B_f]$

~~$P[B_f|A] = 1/1500$~~

$Q = P[A]?$

$P[B_m] = 1/2$

$P[B_f] = 1/2$

$P[A]$

$P[A^c]$

~~$P[B_m|A^c]$~~

 ~~B_f~~

~~$P[B_m|A^c]$~~

$P[A] = P[A|B_m] P[B_m] + P[A|B_f] P[B_f]$

$P[A|B_m] = 1/4000$

$P[A|B_f] = 1/15000 \dots$

$P[A] = \frac{1}{4000} \cdot \frac{1}{2} + \frac{1}{15000} \cdot \frac{1}{2} =$

$8.889E^{-5}$

$Q = \cancel{P[B_m|A]} P[B_m|A]?$

$P[B_m|A] = P[B_m \cap A] / P[A]$

~~$P[B_m \cap A] = 8.889E^{-5}$~~

~~$P[B_m|A] =$~~

$P[A \cap B_m] = P[A|B_m] P[B_m] = 5.556E^{-5} = P[B_m \cap A]$

$P[B_m|A] = 5/8$

$P[A|B_m] = 1/4000, P[A] = \frac{8}{40000}, P[A|B_m] \neq P[A]$

$P[B_m|A] = 5/8, P[B_m] = 1/2, P[B_m|A] \neq P[B_m]$

not independent