ECE 361: Probability for Engineers **HW # 1** due Tuesday April 11 in class

1. A thermometer measures temperatures from -40 to 130°F. (a) Define the universal set for this measurement (b) specify the subset for temperature measurements not exceeding waters freezing point (c) specify the subset for temperature measurements exceeding waters freezing point, but not exceeding 100°F.
2. A random noise measurement shows that the values lie between -10 and 10 V. (a) Define the universal set for this noise voltage (b) What is the set to describe the voltages if the noise is passing through a halfwave rectifier (c) if you add a dc voltage of -3V , repeat (a) and (b).
3. Use Venn diagrams for three sets A, B, and C, shade the areas corresponding to the following sets

$$(a)\ \ (A\cup B)-C \quad (b)\ \ \overline{B}\cap A \quad (c)\ \ A\cap B\cap C \quad (d)\ \ \left(\overline{A\cup B}\right)\cap C$$

4. Events A and B are such that p(A)=0.2, p(B)=0.3 and p(AB)=0.1. Evaluate the following probabilities

$$p\left(\overline{A}\right)$$
$$p\left(\overline{B}\right)$$
$$p\left(A\cup B\right)$$
$$p\left(\overline{A}\cap\overline{B}\right)$$

5. Using the result

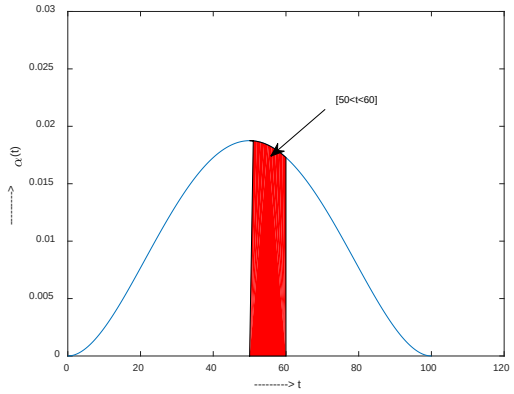
$$p\left(A\cup B\right)=p\left(A\right)+p\left(B\right)-p\left(A\cap B\right)$$

Obtain an expression for $p\left(A\cup B\cup C\right)$. (A,B, and C are not mutually exclusive)

6. Suppose 25% of the population of a city read newspaper A, 20% read newspaper B, 13% read C, 10% read both A and B and 8% read both A and C and 5 % read B and C and 4% read all three. If a person is elected at random, what is the probability that he/she does not read any of the newspapers?
7. A die is tossed. A is the event {even number shows up} and B is the event {number larger than 3 shows up}. Find p(A), p(B), p(A∪B), p(A ∩ B).
8. We denote by **t** the age of a person when he/she dies, ignoring the population that lives beyond 100 years. In other words, we have {0≤t≤100). It has been determined that the lifespan can be defined by a function

$$\alpha\left(t\right)=3e^{-9}t^{2}\left(100-t\right)^{2},0\le t\le 100$$

You will notice that $\int_0^{100} \alpha(t)\,dt = 1$. This means that the probability that a person dies between 50 and 60 is $\int_{50}^{60} \alpha(t)\,dt = 0.1874$. This is shown by the red shaded area below



What is the probability that a person is alive at 60 ?

9. A fair die is rolled. A ={6} and B={2} or {5}. Define a third event C such that p(C)=1-p(A)-p(B).

10. The sample space consists of 10 equally likely events S={z_1,z_2,..,z_{10}}. If A={z_1,z_5,z_9}, B={z_1,z_2, z_6,z_9}, C ={ z_6,z_9}, find

    p(A∪C)

    $p\left(B \cup \overline{C}\right)$

    P[A∩(B∪C)]

    $p\left(\overline{A \cup B}\right)$

    P[(A∪(B∩C)]

P. M. Shankar, March 31, 2017