

ECE 353: Introduction to Probability and Random Signals - Spring 2017
Homework 4 - Solutions

1. Suppose A is a random number chosen uniformly from the interval $(-8, 8)$, what is the probability that the quadratic equation

$$x^2 + Ax + 4 = 0$$

has no real root?

Here, $a = 1$, $b = A$, and $c = 4$ and the quadratic equation is $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

2. Assume the resistance of R is a random variable, uniformly distributed on the interval $(800\Omega, 1200\Omega)$
- (a) Find the PDF of the resistance
 - (b) Calculate $P(900\Omega \leq R \leq 1000\Omega)$
 - (c) Calculate $P(R = 1100\Omega)$

3. In a restaurant known for its unusual service, the time, in minutes, that a customer has to wait before he captures the attention of a waiter is specified by the following CDF:

$$F_X(x) = \begin{cases} \frac{x^2}{2}, & 0 \leq x \leq 1 \\ 1/2, & 1 \leq x \leq 8 \\ \frac{1}{4} - \frac{3}{2}, & 8 \leq x \leq 10 \\ 1, & x \geq 10 \end{cases}$$

- (a) Compute and sketch the PDF $f_x(x)$
 - (b) Verify the area under the PDF is indeed unity
 - (c) What is the probability that the customer will have to wait at least 7 minutes?
4. In an automatic meter reading system, the electric measure and transmit the message to receivers. If the transmission fails, it tries again. If each message is repeated at most 5 times and a single transmission of a message is successful with probability $p = 0.75$. If X is the random variable of the number of transmission, what is the probability mass function (PMF) of X ? How about the CDF?