ECE 302 Homework 3
Due July 6, 2016

Reading assignment: chapter 3 section 3.3; chapter 4 sections 4.3, 4.5.

1. Let X be a random variable with pdf

$$f_X(x) = \frac{1}{2}e^{-|x|}$$

and define the random variable $Y = g(X)$, where

$$g(x) = \begin{cases} |x| & , -1 \le x \le 1 \\ 1 & , \text{else} \end{cases}$$

Find and plot the pdf and cdf of Y.

2. Let X be a random variable with pdf

$$f_X(x) = \begin{cases} 1/2 & , -1 \le x \le 1 \\ 0 & , \text{else} \end{cases}$$

Let $Y = X^n$ where n is a positive number.

(a) Find the cdf and pdf of Y.

(b) Find the nth moment of X by evaluating $\mathbb{E}[X^n]$ and $\mathbb{E}[Y]$.

3. Let M be geometric random variable with pmf

$$p_M(m) = (1 - p)^{m-1}p, \quad m = 1, 2, \ldots,$$

where $0 < p < 1$.

(a) Find the mean and variance of M.

(b) Let $g(m) = (m - k)u(m - k)$, where $u(x)$ denotes the unit step funciton and $k > 0$, and define $N = g(M)$. Find the pmf of N.

(c) Find the mean and variance of N.