Assignment 6
MSO-201: Probability and Statistics

1. Suppose the PDF of a random variable X is $f_X(x) = x^2/18$, for $-3 < x < 3$, and zero elsewhere. Find $P(|X| < 1)$ and $P(X^2 < 9)$.

2. Suppose the PDF of a random variable X is $f_X(x) = (x+2)/18$, for $-2 < x < 4$, and zero elsewhere. Find $P(|X| < 2)$ and $P(X^2 < 1)$.

3. Let X have the PDF $f_X(x) = 2x$, for $0 < x < 1$, and zero elsewhere. Compute the probability that X is at least $3/4$ given that X is at least $1/2$.

4. Let X be the number of gallons of ice cream that is requested at a certain store on a hot summer day. Assume that $f_X(x) = 12x(1000 - x)^2/10^{12}$, for $0 < x < 1000$, and zero elsewhere, is the PDF of X. How many gallons of ice cream should the store have on hand each of these days, so that the probability of exhausting its supply on a particular day is 0.05?

5. Suppose X is a random variable with the following PDF $f(x) = |x|/4$, where $-2 < x < 2$, and zero elsewhere. Find a, such that $P(X > a) = 0.25$.

6. If the pdf of X is $f_X(x) = 2xe^{-x^2}$, for $0 < x < \infty$, and zero elsewhere, determine the PDF of $Y = X^2$.

7. Suppose X is a random variable with the following PMF: $P(X = i) = 1/2^i$, for $i = 1, 2, 3 \ldots$. Find $E(X)$.

8. Suppose X is a random variable with the following PDF: $f_X(x) = 3e^{-3x}$, for $x > 0$ and zero elsewhere. Find $E(X)$

9. Let X have the pdf $f_X(x) = 3x^2$, for $0 < x < 1$ and zero elsewhere. Consider a random rectangle whose sides are X and $(1 - X)$. Determine the expected value of the area of the rectangle.

10. Let X have the pdf $f_X(x) = 3x^2$, for $0 < x < 1$ and zero elsewhere. Compute $E(X^3)$. Find the PDF of $Y = X^3$.