STAT/MA 41600
In-Class Problem Set #24: October 12, 2016

**1.** Consider a random variable $X$ that has a probability density function of the form $f_X(x) = (k)(x)(5-x)$ for $0 \le x \le 5$, and $f_X(x) = 0$ otherwise, where $k$ is a constant.
**1a.** What is the value of $k$?
**1b.** Find the probability that $X$ is bigger than 4 or less than 1, i.e., $P(X > 4 \text{ or } X < 1)$.

**2.** Suppose that the time needed to wait for the next bus to appear is a random variable $Y$ with probability density function $f_Y(y) = (2/7)e^{-(2/7)(y)}$ for $y > 0$, and $f_Y(y) = 0$ otherwise. Compute the probability that $Y$ is no further than 1 unit away from 3, i.e., $P(|Y - 3| \le 1)$.

**3.** Suppose that the CDF of a random variable $X$ is $F_X(x) = 1 - e^{-5x}$ for $x > 0$, and $F_X(x) = 0$ otherwise.
**3a.** What is the probability density function of $X$?
**3b.** Use the CDF to compute $P(1/4 < X < 1/3)$. Hint: we have $P(1/4 < X < 1/3) = P(X < 1/3) - P(X \le 1/4)$.
**3c.** Use the probability density function to find $P(1/4 < X < 1/3)$. Your solution should agree with **3b** (this is just another method of solution).

**4.** Consider a random variable $X$ whose probability density function is constant on the interval $[30, 100]$, and the pdf is zero otherwise. Compute $P(80 < 2X < 164)$.