ENEE324-03. Problem set 6

Date due April 7, 2015

1. Let X be a random uniform point chosen from the interval $(0, \pi/4)$. Find $E[\cos(2X)]$, $E[\cos^2 X]$.

2. Let X be an RV with the CDF

$$F_X(x) = \begin{cases} 0, & x < 4 \\ 1 - \frac{16}{x^2}, & x \geq 4. \end{cases}$$

Find EX; show that $\mathrm{Var}(X)$ does not exist.

3. Let X be an RV with the PDF

$$f_X(x) = \begin{cases} \frac{2}{x^2} & 1 < x < 2 \\ 0 & \text{o/w} \end{cases}$$

Find $E[\ln(X)]$.

4. Let X be an RV with PDF $f_X(x) = 6x(1-x), 0 < x < 1$. Find $P(|X - EX| \leq 2\sigma_X)$, where σ_X is the standard deviation of X.

5. Suppose that the Vamoose bus to NYC leaves College Park every 30 min starting at 5a.m. (in reality, they depart from Bethesda rather than College Park, about every hour, but never mind). A student arrives at the deprature point at a random time between 8:45am and 9:45am. What is the probability that before leaving for NYC he waits ≤ 10min; ≥ 15min.?

6. Suppose that $b, 2 \leq b \leq 4$ is a random uniform RV. Find the probability that the quadratic equation $x^2 + bx + 1 = 0$ has at least one real root.

7. The grade in a (hypothetical) ENEE324 course is a normal RV $\sim \mathcal{N}(72, 7)$. Say that $\geq 90\%$ is an A; $\geq 80\%$ is a B; $\geq 70\%$ is a C; $\geq 60\%$ is a D. What percent of the students get A, B, C, D, F?