ECE 534: FALL 2018
HOMEWORK II
ISSUED: SEPTEMBER 20TH. DUE OCTOBER 4TH.

- **Problem 1.** Let $g(x)$ equal to $\frac{1}{\sqrt{x}}$ on $(0, 1]$ and $g(x) = 0$ elsewhere, including the point $x = 0$. Is $g(x)$ Riemann integrable (you may want to read about improper integrals). Explain how you would compute the Lebesgue integral of the function. Compare the values of the two integrals.
- **Problem 2.** Let W_n denote a random variable with mean μ and variance b/n^p, where $p > 0$, μ, and b are constants independent on n. Prove that W_n converges in probability to μ.
- **Problem 3.** Prove that almost sure convergence of a sequence of random variables X_n, $n = 1, 2, \ldots$ to a constant μ is equivalent to the requirement that for every $\epsilon > 0$,
$$\lim_{n\to\infty} P\{\sup_{k>n} |X_k - \mu| \geqslant \epsilon\} = 0.$$
Also, show that
$$\sum_{n=1}^{\infty} P\{|X_n - \mu| \geqslant \epsilon\} < \infty$$
implies almost sure convergence.
- **Problem 4.** Problems 2.5, 2.11, 2.13, 2.15 from the text.