Indian Institute of Science

E9-252: Mathematical Methods and Techniques in Signal Processing

Instructor: Shayan G. Srinivasa

Home Work #1, Fall 2016

Late submission policy: Points scored = Correct points scored $\times e^{-d}$, d = # days late

Assigned date: Sep 5^{th} 2016 **Due date:** Sep 12^{th} 2016 in class

---

PROBLEM 1: Problems 1.4.15 and 1.4.31 from Moon and Stirling.

$(12 + 8$ pts.)

PROBLEM 2: Vectors belonging to $\mathbf{R}^2$ are jointly distributed uniformly on a rhombus whose vertices are $(\pm A, 0)$ and $(0, \pm A)$. Obtain the marginal densities. Examine if the random variables are (a) statistically independent (b) correlated? (10 pts.)

PROBLEM 3: Consider a random process $Y(t) = A\sin(\omega t)$ where A is a random variable uniformly distributed between $[-1, 1]$. Sketch the sample functions and obtain the probability distribution and cummulative distribution functions for the time instants $t = 0, \frac{\pi}{4\omega}, \frac{\pi}{2\omega}$. (5 pts.)

PROBLEM 4: Sketch the regions in $\mathbf{R}^2$ for all vectors whose $\mathcal{L}_3$ and $\mathcal{L}_4$ norms are less than or equal to unity. (5 pts.)

PROBLEM 5: Solve problems 2.2.28, 2.2.32 and 2.3.33 from Moon and Stirling. $(4 + 3 + 3$ pts.)