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 5th 2016

Due date: Sep 12th 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 \mathbb{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 \mathbb{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.)