# Indian Institute of Science <br> E9-252: Mathematical Methods and Techniques in Signal Processing <br> Instructor: Shayan G. Srinivasa <br> Home Work \#1, Fall 2016 

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

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

$$
(12+8 \text { pts. })
$$

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 $t=0, \frac{\pi}{4 \omega}, \frac{\pi}{2 \omega}$.

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.
Problem 5: Solve problems 2.2.28, 2.2.32 and 2.3.33 from Moon and Stirling.

