

# Math 586. Homework 3

## Due October 5 by 11pm

Note: if you are using computer, please attach or e-mail your code.

1. Use the formula for conditional density to prove the formula (1) from Handout 5.
2. Find the covariance and correlation between  $V(j), V(k)$  where  $V(k) = \sum_{i=1}^k W_i$  is the random walk process from the beginning of Handout 7.
3. Suppose that  $V(x), x = 0, \pm 1, \pm 2, \dots$  is a discrete-time stationary Gaussian process with autocovariance function  $C(x) = 0.5^{|x|}$ . Let  $X = V(-1) + V(0) + V(1)$  and  $Y = V(0) + V(1) + V(2)$ .
  - (a) Find  $Var(X)$ .
  - (b) Find  $Cov(X, Y)$ . Try to use matrix calculations.
4. Show that the “hole” covariance function  $C(h) = (1 - h)e^{-h}$  is not valid in 2D. That is, find the locations in  $\mathbb{R}^2$  for which  $C(h)$  produces an invalid covariance matrix.