

In-Class Quiz 1 (Gaussian Process)

1 Problem 1

1.1 a

Show that if a gaussian process is WSS then it is SSS.

1.2 b

consider the following gaussian process:

$$X_0 \sim \mathcal{N}(0, \sigma^2)$$

$$X_n = \frac{1}{2}X_{n-1} + Z_n, n \geq 1$$

where Z_1, Z_2, \dots are iid $\mathcal{N}(0, 1)$ and independent of X_0 . find σ such that X_n is SSS.

Hints:

1. You can assume that there is some value of σ that this process is SSS

2. A stochastic process $x(t)$ is called wide-sense stationary (WSS) if its mean is constant and its auto-correlation depends only on $\tau = t_1 - t_2$

$$E[x(t)] = \nu \tag{1}$$

$$E[x(t + \tau)x(t)] = R(\tau) \tag{2}$$

3. A stochastic process $x(t)$ is called strict-sense stationary (SSS) if its statistical properties are invariant to a shift of the origin. This means that the processes $x(t)$ and $x(t + c)$ have the same statistics for any c .