ECON 522. Exercise 1.1

1. Simulate a series of $n = 1000$ observations from a Gaussian white noise process with $\sigma^2 = 1$. Plot the data and show the theoretical mean in red. Compare the true ACF and the sample ACF (to lag 20). Repeat several times.

2. Same as above but using the moving average process

$$x_t = 2 + 0.5w_{t-1} + 0.8w_t + 0.2w_{t+1},$$

   where $\{w_t\}$ is Gaussian white noise with variance 1.

3. Same as above but using the autoregressive process

$$\begin{aligned} x_t &= 1 + 0.95x_{t-1} + w_t \\ x_0 &= 0 \end{aligned}$$

   where $\{w_t\}$ is Gaussian white noise with variance 1. (For this model, does it look as though the initial condition is causing an issue? Can you eliminate this issue?)

4. Same as above but using the signal plus noise model

$$x_t = s_t + w_t,$$

   where $s_t = 2\cos\left(2\pi\frac{t+15}{20}\right)$ and $\{w_t\}$ is Gaussian white noise with variance 1. (Why do the true and sample ACFs not look similar for this model?)