This question tests your ability to write out MATLAB code as you used on your three assignments (and *not* any other computer language). Consider the following AR1 process

$$z' = \rho z + \sqrt{(1-\rho^2)}\varepsilon, \text{ where } \varepsilon \sim N(0,\sigma).$$

1. Write out the MATLAB code to simulate this process for a random sample of N values for ε. Your code should compute the mean, standard deviation, and coefficient of autocorrelation for the sample.

2. A macroeconomist wants to approximate the AR1 process using a 3-state Markov chain. The variable z is constrained to always lie in a time-invariant grid of 3 points so that $z \in \{-s, 0, s\}$.

   (a) The transition matrix for the Markov chain, T, is given by

   $$T = \begin{bmatrix} \pi_{11} & \pi_{12} & \pi_{13} \\ \pi_{21} & \pi_{22} & \pi_{23} \\ \pi_{31} & \pi_{32} & \pi_{33} \end{bmatrix},$$

   where π_{ij} is the odds of going *from* state i *to* state j. Write out the MATLAB code for approximating this transition matrix. Hint: the MATLAB syntax for evaluating the *cumulative* distribution function for the normal distribution is NORMCDF(shock, mean, sd), where shock is the value of the shock, mean is the mean of the distribution, and sd is the standard deviation.

   (b) If

   $$p = \begin{bmatrix} p_1 \\ p_2 \\ p_3 \end{bmatrix},$$

   is a probability vector describing the current odds of being in each state, then how would you compute the odds of being in each state for next period? How would you compute the stationary distribution associated with this Markov chain? Write out the MATLAB code for doing this, as well as the code for the long-mean, long-run standard deviation, and the long-run coefficient of autocorrelation.