Instructions: Do your work on your own paper and give only the numerical answers in eCampus.
Give your answers rounded to **four digits to the right of the decimal,** except for part e round
to three digits.

Consider a small machine shop. Customers arrive to the shop according to Poisson
process with mean rate of three per day. Because the shop is small, they only work on
one job at a time and if they stay busy they can average two completed jobs per day. If
two jobs are in the system and a customer arrives with a job, that customer is sent to
another shop; thus, there are at most two jobs in the shop at any time. Let $Z(t)$ be a
process with state space $\{0,1,2\}$ where $Z(t)$ is the number of jobs in the shop at time t and
assume that the time units for t are in days.

   a. Notice that $\{Z(t)\}$ is a Markov process. Form the generator matrix for this
      process. What is $G(0,1)$?

   b. What is $G(1,1)$?

   c. One eigenvalue of G is a number between -2 and -3. What is its value rounded to
      four digits to the right of the decimal.

   d. What is $\lim_{t\to\infty}P\{Z(t) = 0 \mid Z(0) = 0\}$ rounded to four digits to the right of the
      decimal?

   e. Given that the shop was empty at the start of the day, what is the probability that
      it will be empty at noon on the first day? Assume each day is from 8AM to 4PM
      so that noon is t=0.5. Round your answer to three digits to the right of the
      decimal.