Directions

Scan and upload your *handwritten* solutions to eLearning by the end of the day on Monday, October 17, after the first exam. Show sufficient work, not just answers, or credit may not be given. Showing matrix codes is not necessary for this assignment, but you may use the functions on your calculator for faster computation.

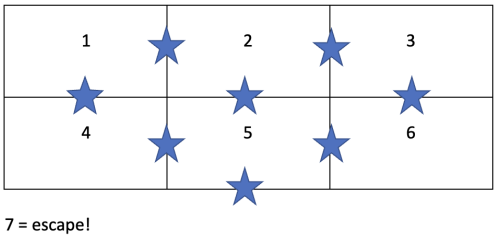
Problem 1 (5 points)

An Uber driver moves between the airport A and two hotels B and C according to the following rules. If the driver is at the airport, they will be at hotel B next with probability 1/4 and at hotel C with probability 3/4. If at a hotel, they will return to the airport with probability 4/5 and go to the other hotel with probability 1/5. Assign each state the following values: $A = 0,\ B = 1,\ C = 2$.

(a) Find the transition probability matrix for this Markov chain.
(b) Suppose the driver is initially at the airport. Find the probability for each of their three possible locations after 3 trips.
(c) Suppose the driver is initially in hotel B. After 3 trips, in which location do we expect the Uber driver to be at?
(d) Find the stationary distribution of the chain by solving an appropriate system of equations. Interpret your final result in the context of the problem.

Problem 2 (5 points)

Suppose a rat is in a maze with 6 rooms as shown in the figure below. Each star represents a path from one room to another or to escape the maze. Once the rat escapes the maze, assume that it never goes back into the maze. Answer the following.



(a) Find the transition probability matrix for this Markov chain.
(b) Sketch the graph of the chain and classify the 7 states.
(c) Given that the rat begins in room 1, what is the expected number of visits to room 2?
(d) Given that the rat begins in room 1, what is the probability of visiting room 2?

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