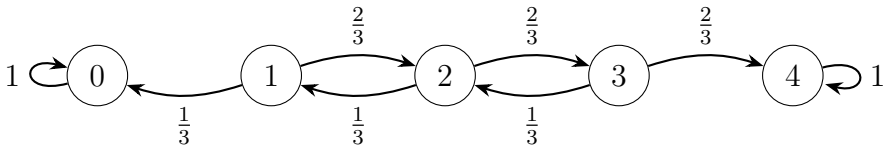
State clearly any theorem that you use. Correct computations receive full credit; partial credit is awarded for valid justifications.

Notation is as in the class notes.

1. **(4 marks)** Consider the random walk with state space

$$S = \{0, 1, 2, 3, 4\}$$

and transition probabilities $p = \frac{1}{3}$ to the left and $q = \frac{2}{3}$ to the right, as shown below.



Find the expected time for the chain to get absorbed when it starts from state 2.

2. **(4 marks)** Consider the Markov chain in Figure 1. Whenever transition probabilities are not specified, assume that the probability is split equally among all outgoing arrows from that state.

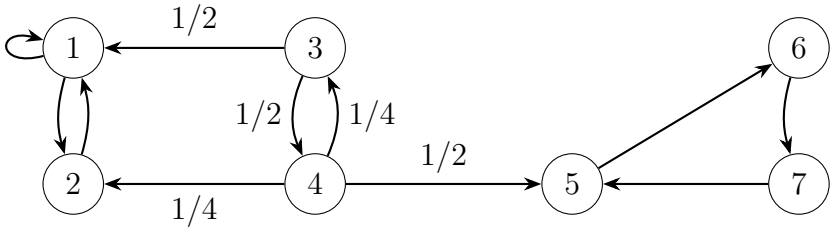


Figure 1

Given $X_0 = 3$, find the long-run rate of visits to state 1.