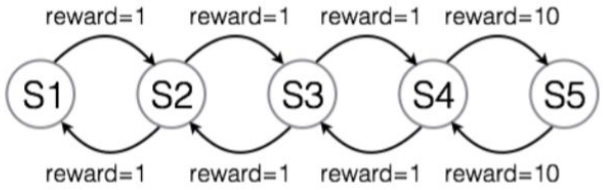
PROBLEM 4

Problem 5 Consider a reinforcement learning problem specified by the following Markov Decision Process (MDP).



We have five states representing steps along one direction. Call these states $S1$, $S2$, $S3$, $S4$, and $S5$. From each state, except the end states, we can move either left or right. The available actions in state $S1$ is just to move right while the action available in $S5$ is to move left. We can move left or right in each intermediate state. The reward for taking any action is 1 except when moving right from $S4$ or left from $S5$ which provide reward 10. Assume a discount factor $\gamma = 0.5$. Note that $\sum_{i=1}^{\infty} 0.5^i = 1$.

(a) **(5 points)** What is the optimal policy for this MDP? Specify action (L/R) to take in each state.

$$S1: (\quad) \quad S2: (\quad) \quad S3: (\quad) \quad S4: (\quad) \quad S5: (\quad) \tag{12}$$

(b) Suppose we apply value iteration on this MDP. What is the value of state S3 after

(2 points) one value iteration

(2 points) two value iterations

(3 points) ∞ number of value iterations