

$$\underline{Q1} \quad Q(s_1, a_1) = R(s_1, a_1) + P(s_1, a_1, s_2) V(s_2) + P(s_1, a_1, s_1) V(s_1) \\ = 10, 6$$

$$Q(s_1, a_2) = R(s_1, a_2) + P(s_1, a_2, s_1) V(s_1) + P(s_1, a_2, s_2) V(s_2) \\ = 11, 2$$

$$\Rightarrow \boxed{\pi_0(s_1) = a_2}$$

Similarly we can find $\boxed{\pi_0(s_2) = a_1}$

$$Q_{k+1}(s_1, a_1) = 8 + (0, 2) V_k(s_1) + (0, 6) V_k(s_2)$$

$$Q_{k+1}(s_1, a_2) = 10 + (0, 1) V_k(s_1) + (0, 2) V_k(s_2)$$

If we prove that $V_k(s_1) > 12$ and $V_k(s_2) > 5$

$$\text{then } Q_{k+1}(s_1, a_1) > Q_{k+1}(s_1, a_2) \Rightarrow \pi_k(s_1) = a_1$$

Which is the case as $V_k(s_1) > 12$ and $V_k(s_2) > 5$ $\forall k$.

Similarly we can find that

$$Q_k(s_2, a_2) > Q_k(s_2, a_1) \Rightarrow \pi_k(s_2) = a_2$$

Q4 I implemented it

and you can play with the

parameters as you wish.