

# Exercise 7

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## Task 1 Linear function approximation

a.)

With linear function approximation we have a value function with the following form:

$$\hat{v}(s, w) = w^T x(s) = \sum_{i=1}^d w_i x_i(s)$$

For tabular methods we can write all  $x_i(s)$  as  $x_i(s) = [0 \dots \underbrace{v(s)}_{i\text{-th entry}} \dots 0]^T$

This way our value function can be written the same as for the linear function approximating with the weight vector  $w = [1 \dots 1]$ .

This way the tabular version is only a special case of the linear function approximation with the  $\dim(w) = |S|$ .

b.)

Sarsa:  $Q(S_t, A_t) \leftarrow Q(S_t, A_t) + \alpha \delta_t$  with  $\delta_t = [R_{t+1} + \gamma Q(S_{t+1}, A_{t+1}) - Q(S_t, A_t)]$