## Foundations of Artificial Intelligence

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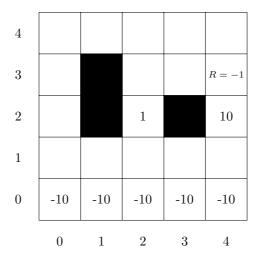
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## Exercise Sheet 9 Due: Monday, July 13, 2020

## Exercise 9.1 (Markov Decision Processes)

Consider the Markov decision process underlying the sequence decision problem for the grid world in exercise 8.2.

- (a) Perform a policy-improvement step for the initial state **S** and the (non-optimal) policy E. Which is the optimal action in this state? The utility of all non-terminal states is assumed to be zero and rewards are assumed to be additive (i.e. not discounted).
- (b) Perform a first step of the value iteration algorithm for state (4,3) for the slightly **modified grid world** below. The immediate reward of this state is R = -1. Assume discounted rewards and a discount factor of  $\gamma = 0.5$ . Initially, all non-terminal states have a utility of zero.



## Exercise 9.2 (Decision Trees)

Specify decision trees representing the following boolean functions:

- (a)  $A \times OR B$
- (b)  $(A \wedge B) \vee (C \wedge D)$

Note: The exercise sheets may be worked on in groups of up to three students.