



# HOMEWORK

UNIVERSITY OF SOUTH CAROLINA

COMPUTER SCIENCE AND ENGINEERING

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## CSCE 580: Artificial Intelligence

MDPs

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*Author:*

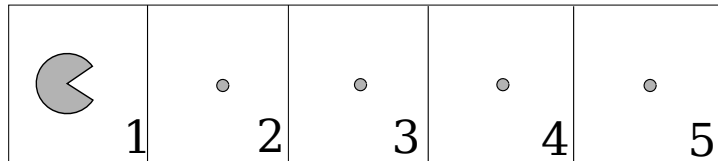
Your Name (ID: Your USC ID)

Release Date: March 17, 2019

**Due Date: Monday March 11, 11:59 pm**

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### MDPs: Bonus level!



Pacman is in a bonus level! With no ghosts around, he can eat as many dots as he wants. He is in the  $5 \times 1$  grid shown. The cells are numbered from left to right as  $1, \dots, 5$ . In cells 1 through 4, the actions available to him are to move **Right** (R) or to **Fly** (F) out of the bonus level. The action **Right** deterministically lands Pacman in the cell to the right (and he eats the dot there), while the **Fly** action deterministically lands him in a terminal state and ends the game. From cell 5, **Fly** is the only action. Eating a dot gives a reward of 10, while flying out gives a reward of 20. Pacman starts in the leftmost cell (cell 1).

We write this as an MDP where the state is the cell that Pacman is in. The discount is  $\gamma$ .

Consider the following 3 policies:

$$\pi_0(s) = F \text{ for all } s$$

$$\pi_1(s) = R \text{ if } s \leq 3, F \text{ otherwise}$$

$$\pi_2(s) = R \text{ if } s \leq 4, F \text{ otherwise}$$

1. Assume  $\gamma = 1.0$ . What is:

(a)  $V^{\pi_0}(1)$ ?

20

(b)  $V^{\pi_1}(1)$ ?

50

(c)  $V^{\pi_2}(1)$ ?

60

(d)  $V^*(1)$ ?

60