1 What is the value of the geometric series $\sum_{i=1}^{\infty} \gamma^i$ for some $0 < \gamma < 1$?

(a) $\infty$
(b) $\frac{1}{1-\gamma}$
(c) $\frac{\gamma}{1-\gamma}$
(d) undefined (the series does not converge)

2 Consider the vectors $x_1 = [1, 0, 0]$ and $x_2 = [0, 1, 0]$. How many vectors $v \in \mathbb{R}^3$ with unitary norm (i.e., $\|v\|_2 = 1$) are there that are orthogonal to $x_1$ and $x_2$ (i.e., $v^\top x_1 = 0$ and $v^\top x_2 = 0$)?

(a) none
(b) 1
(c) 2
(d) $\infty$

3 A lost tourist arrives at a point with 2 roads $A$ and $B$. Road $A$ leads to the city and takes either 1 or 3 hours, depending on traffic, with equal probability. Road $B$ brings him to the city after 4 hours on average. Since there are no signs on the road, the tourist chooses a road with equal probability; what is the mean time until the tourist arrives to the city?

(a) 2 hours
(b) 2.5 hours
(c) 3 hours
(d) none of the above

4 In the lecture modules we showed that the Bellman operator is a contraction if $\gamma < 1$. Consider doing value iteration with $\gamma = 0$. How many iterations will it take for value iteration to converge to the optimal value function?

(a) 1
(b) 5
(c) 100
(d) unbounded