

Question Q1.12

A circular racetrack has a radius of 500 m. What is the displacement of a bicyclist when she travels around the track from the north side to the south side? When she makes one complete circle around the track? Explain your reasoning.

Solution

Draw the racetrack for the two situations.



Displacement is the vector that points from the starting position to the ending position.

$$\mathbf{d} = \mathbf{x}_f - \mathbf{x}_i$$

The displacement in the first case is (the vector points down, so the y -component is negative)

$$\mathbf{d}_1 = \langle 0, -1000 \rangle = -1000\hat{\mathbf{j}},$$

and the displacement in the second case is (the starting and ending positions are the same)

$$\mathbf{d}_2 = \langle 0, 0 \rangle = \mathbf{0}.$$