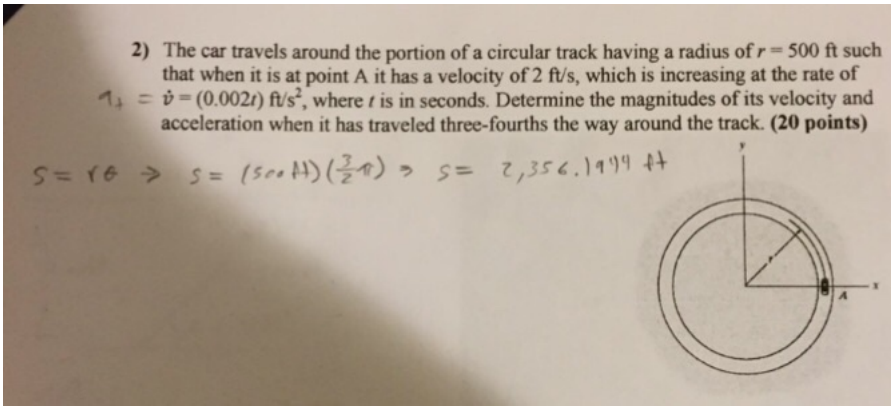
Question: The car travels around the portion of a circular track having a ...

(2 bookmarks)



Show transcribed image text

Expert Answer

Anonymous answered this
392 answers

Was this answer helpful? 0 0

Velocity at A, $v_0 = 2$ ft/s

$a_t = \dot{v} = (0.002t)$ ft/s^2

Total distance of track, $= 2\pi r = 2\pi(500)$
$= 1000\pi$ ft

The three-fourths travel distance is

$$d = s = \frac{3}{4}(1000\pi) = 750\pi \text{ ft}$$

we know that,

$$s = v_0 t + \frac{1}{2} a t^2$$

given,

$$a_t = 0.002t$$

$$\frac{dv}{dt} = 0.002t$$

$$dv = 0.002t \cdot dt$$

Integrate on both sides

$$\int_2^{v_B} dv = \int_0^t 0.002t\, dt$$

$$(v_B - 2) = \frac{0.002t^2}{2}$$

$$\rightarrow \boxed{v_B = (2 + 0.001t^2) \text{ ft/s}}$$

and $v_B = 2 + 0.001t^2$

$$\frac{ds}{dt} = 2 + 0.001t^2$$

Integrate on both sides

$$\int_0^{750\pi} ds = \int_0^t (2 + 0.001t^2)\, dt$$

$$[s]_0^{750\pi} = 2t + 0.001\frac{t^3}{3}$$

$$750\pi = 2t + (3.333 \times 10^{-4}) \cdot t^3$$

$$\cdots t^3 + 2t - 2356.2 = 0$$

by solving

$$\boxed{t = 181.51 \text{ sec}}$$

at $S = 750\pi$

$\Rightarrow$ velocity, $v_B = (2 + 0.001 t^2)$

$= 2 + (0.001)(181.51)^2$

$$\boxed{v_B = 34.95 \text{ ft/sec}}$$

acceleration, $a = \dot{v} = 0.002t$

$= 0.002(181.51)$

$\dot{v} = 0.36302 \text{ ft/sec}^2$

Hence at three-fourth distance,

velocity, $v_B = 34.95$ ft/sec

Acceleration, $a = \dot{v} = 0.36302$ ft/sec^2

Comment >

Practice with similar questions

Q: The car travels around the portion of a circular track having a radius of r = 400 ft such that when it is at point A it has a velocity of 5 ft/s. which is increasing at the rate of v = (0.00 4t) ft/s^2. where t is in seconds. Determine the magnitude of the acceleration when it has traveled three-fourths the way around the track. Determine the magnitude of the velocity when it has...

A: See answer 100% (3 ratings)

Q: The car travels around the portion of a circular track having a radius of r = 600 ft such that when it is at point A it has a velocity of 5 ft/s, which is increasing at the rate of v = (0.002t) ft/s^2. where t is in seconds. Determine the magnitude of the velocity when it has traveled three-fourths the way around the track. Express your answer to three significant figures and...

A: See answer 100% (7 ratings)

Show more

Questions viewed by other students

Q: I need help with 12-126. I do not understand what to do with the increasing rate of .002t ft/s^2. Then I do not know how to find the final magnitude of the velocity and acceleration when it it three-fourths around the track.

A: See answer

Q: Please help!

A: See answer 100% (3 ratings)

Show more