

MA205 - Integral Calculus

Lesson 35: Arc Length II

1. Suppose a car travels around an elliptical track given (in miles) by the curve

$$\langle 3 \sin(t), 5 \cos(t) \rangle.$$

How far has the car traveled if it goes once around the track?

2. If you slide down a spiral slide (whee!) and your position is described (in feet) by the space curve

$$\langle \cos(t), \sin(t), -t \rangle,$$

then how far have you traveled after 10 seconds?

3. Suppose a particle moving in the xy -plane has acceleration only due to gravity. That is,

$$\mathbf{a}(t) = \langle 0, -9.8 \rangle,$$

in m/s^2 . If the particle travels for 3 seconds and has an initial velocity of $\langle 2, 1 \rangle$, how far has it traveled?

4. Find the length of the curve

$$x = 12t, \quad y = 8t^{\frac{3}{2}}, \quad z = 3t^2$$

from the point $(12, 8, 3)$ to the point $(48, 64, 48)$. (Hint: What t values does this imply?)