

MA205 - Integral Calculus
Lesson 20: 3D Arc Length

Mechanics Based Problems

1. Set up and evaluate by hand an integral that represents the length of the following parametric curve over the specified interval:

$$x = \cos(2t), \quad y = \sin(2t), \quad 1 \leq t \leq 3$$

2. Graph the following parametric curve and find its exact length over the specified interval. Use technology.

$$x = e^t - t, \quad y = 4e^{\frac{t}{2}} \quad -8 \leq t \leq 3$$

3. Without technology find the exact length of the curve over the specified interval.

$$\vec{r}(t) = \langle 2 \sin t, 5t, 2 \cos t \rangle, \quad -10 \leq t \leq 10$$

4. Find the length of the curve defined by:

$$\vec{r}(t) = \langle t^2, \sin t - t \cos t, \cos t + t \sin t \rangle, \quad 0 \leq t \leq \pi$$

