

Section 3-4 : Arc Length with Parametric Equations

For all the problems in this section you should only use the given parametric equations to determine the answer.

For problems 1 and 2 determine the length of the parametric curve given by the set of parametric equations. For these problems you may assume that the curve traces out exactly once for the given range of t 's.

1. $x = 8t^{\frac{3}{2}}$ $y = 3 + (8-t)^{\frac{3}{2}}$ $0 \leq t \leq 4$

2. $x = 3t + 1$ $y = 4 - t^2$ $-2 \leq t \leq 0$

3. A particle travels along a path defined by the following set of parametric equations. Determine the total distance the particle travels and compare this to the length of the parametric curve itself.

$$x = 4 \sin\left(\frac{1}{4}t\right) \quad y = 1 - 2 \cos^2\left(\frac{1}{4}t\right) \quad -52\pi \leq t \leq 34\pi$$

For problems 4 and 5 set up, but do not evaluate, an integral that gives the length of the parametric curve given by the set of parametric equations. For these problems you may assume that the curve traces out exactly once for the given range of t 's.

4. $x = 2 + t^2$ $y = e^t \sin(2t)$ $0 \leq t \leq 3$

5. $x = \cos^3(2t)$ $y = \sin(1 - t^2)$ $-\frac{3}{2} \leq t \leq 0$

