

# Lesson # 20 Answers

## MA205 Integral Calculus and Introduction to Differential Equations

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### 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:

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

4  
ANS

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

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

31.08  
ANS

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

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

$$\underline{107.7}$$
 ANS.

4. Find the length of the curve defined by:

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

$$\underline{11.03}$$
 ANS

Problem Solving Problems

1. Use Mathematica to graph the curve with parametric equations  
 $x = \cos t$ ,  $y = \sin 3t$ ,  $z = \sin t$ . Find the total length of this curve correct to four decimal places.

$13.9744$   


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Ans.

2. Compute the arclength of the curve with equations  $x = \sqrt{t}$ ,  $y = \frac{4}{t}$ ,  $z = t^2 + 1$  from  $(1,4,2)$  to  $(2,1,17)$ .

$15.8306$   


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Ans.