

MATH2850 - Elementary Multivariable Calculus, Spring 2014

Quiz 2 - Solutions

Jan 23, 2014

Printed NAME.

- You have 10 min to complete your quiz.
- Please show all your work neatly and indicate your final answers clearly. If you simply write down the final answer without appropriate intermediate steps, you may not get full credit for that problem
- The quiz is closed book and notes. Calculators are not allowed

GOOD LUCK :)

1. Compute the point on the curve $r(t) = (12 \sin t)\mathbf{i} - (12 \cos t)\mathbf{j} + 5t\mathbf{k}$ at a distance 13π units along the curve from the point $(0, -12, 0)$ in the direction of increasing arc length

$$s(t) = 13\pi = \int_a^t |r'(u)| du \quad (1)$$

a can be computed from the data $(0, -12, 0) \Rightarrow r(t)$

$$r(t) = 12 \sin t \mathbf{i} - 12 \cos t \mathbf{j} + 5t \mathbf{k} \Rightarrow \begin{cases} x = 12 \sin t \\ y = -12 \cos t \\ z = 5t \end{cases} \quad (2)$$

now using $(0, -12, 0)$ we get $\begin{cases} 0 = 12 \sin a \\ -12 = -12 \cos a \Rightarrow a = 0 \\ 0 = 5a \end{cases}$

$$r'(t) = 12 \cos t \mathbf{i} + 12 \sin t \mathbf{j} + 5 \mathbf{k}$$

$$|r'(t)| = \sqrt{144 \cos^2 t + 144 \sin^2 t + 25} = \sqrt{144(\cos^2 t + \sin^2 t) + 25} = \sqrt{144 + 25} = 13$$

plug the information in (1) we obtain

$$13\pi = \int_0^t 13 du \Rightarrow 13\pi = 13u \Big|_0^t \Rightarrow t = \pi$$

$t = \pi$ and (2) leads to $\begin{cases} x = 12 \sin \pi \\ y = -12 \cos \pi \\ z = 5\pi \end{cases} \Rightarrow (x, y, z) = (0, 12, 5\pi)$