Will Legg

Week 3 Review

2) where does helix $r(t) = \langle \sin t, \cos t, 3t \rangle$ intersect the spere $x^2+y^2+z^2=10$

plug helix into sphere $\sin^2 t + \cos^2 t + (3t)^2 = 10$

$t = \pm 1$

$r(1) = (\sin(1), \cos(1), 3(1))$
& $r(-1) = (\sin(-1), \cos(-1), -3)$

5) find curve of intersection of cylinder $x^2+y^2=16$ and plane $x+z=5$

use trig sub w/ cylinder $\rightarrow \begin{cases} x = 4\cos t \\ y = 4\sin t \end{cases}$

$\hookrightarrow z = 5 - (4\cos t)$

$r(t) = \langle 4\cos t, 4\sin t, 5 - 4\cos t \rangle$

Week 3 Review

4] Determine arc length of $r(t) = \langle 2t, \frac{2}{3}(t-5)^{3/2}, -t \rangle$ between $9 \le t \le 16$

$r'(t) = \langle 2, (t-5)^{1/2}, -1 \rangle$

a] $$\int_9^{16} |r'(t)| = \int_9^{16} \sqrt{(2)^2 + ((t-5)^{1/2})^2 + (-1)^2}$$

$$= \int \sqrt{4 + t - 5 + 1} = \int \sqrt{t}$$

$$= \int_9^{16} \sqrt{t} = \frac{2}{3} t^{3/2} \Big|_9^{16} = \boxed{\frac{74}{3}}$$

b] $$L(t) = \int_9^t \sqrt{t} = \frac{2}{3} t^{3/2} - 18 = 16$$

↳ solve for t

$t \approx 13$ s. $- 9$ $\boxed{= 4 \text{ sec}}$

11] $\boxed{\text{false}}$ cylinder

$x = \rho \sin\phi \cos\theta$

$y = \rho \sin\phi \sin\theta$

$z = \rho$