

WRITE YOUR NAME:

MAC 2313 Quiz 6
Thursday February 1st

Find the length of the portion of the curve

$$\mathbf{r}(t) = \langle 3 \sin 2t, 2t, 3 \cos 2t \rangle$$

on the interval $[0, 2\pi]$.

$$\vec{r}'(t) = \langle 6 \cos 2t, 2, -6 \sin 2t \rangle$$

$$|\vec{r}'(t)| = \sqrt{(6 \cos 2t)^2 + (2)^2 + (-6 \sin 2t)^2}$$

$$= \sqrt{36 \cos^2 2t + 4 + 36 \sin^2 2t} = \sqrt{36(\underbrace{\cos^2 2t + \sin^2 2t}_1) + 4}$$

$$= \sqrt{36 + 4} = \sqrt{40}$$

$$\text{Length} = \int_{t=0}^{t=2\pi} |\vec{r}'(t)| dt = \int_0^{2\pi} \sqrt{40} dt$$

$$= 2\pi \cdot \sqrt{40} \quad \text{or} \quad 2\pi \cdot \underbrace{\sqrt{4 \cdot 10}}_{2\sqrt{10}} = 4\pi\sqrt{10}$$