Homework Quiz 07: 10.2#41

Find the exact length of the curve where $x = 8 + 9t^2$ and $y = 6 + 6t^3$ on $0 \le t \le 3$.

$x' = 18t$

$y' = 18t^2$

$$\sqrt{(x')^2 + (y')^2} = \sqrt{18^2 t^2 + 18^2 t^4}$$

$$= 18t\sqrt{1 + t^2}$$

$$L = \int_0^3 18t\sqrt{1+t^2}\, dt$$

Let $u = 1 + t^2$

$du = 2t\,dt$

$$= \int_1^{10} 9\sqrt{u}\, du$$

$$= \left[9 u^{3/2} \cdot \frac{2}{3}\right]_1^{10}$$

$$= 6u^{3/2}\Big]_1^{10}$$

$$= 6\left(10^{3/2} - 1\right)$$

$$\approx 183.74$$

Name: Key.

Homework Quiz 08: 13.2#7

If $\vec{r}(t)=\langle 4t, 6t^2, 2t^3 \rangle$, find

a.) $\vec{r}\,'(t) = \langle 4, 12t, 6t^2 \rangle$

b.) $\vec{T}(1) = \left\langle \frac{2}{7}, \frac{6}{7}, \frac{3}{7} \right\rangle$

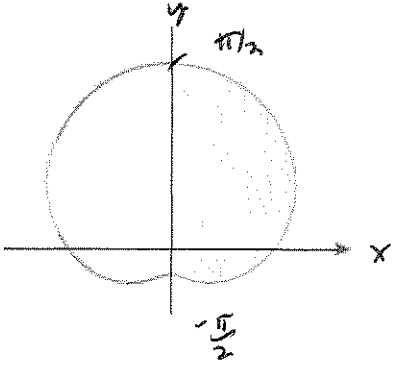
c.) $\vec{r}\,''(t) = \langle 0, 12, 12t \rangle$

d.) $\vec{r}\,'(t) \times \vec{r}\,''(t) = \langle 72t^2, -48t, 48 \rangle$

Name: key

Homework Quiz 09: 10.4#3

Find the area of the shaded region for $r = 4 + 3\sin(\theta)$



$$A = \frac{1}{2}\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (4+3\sin\theta)^2\, d\theta$$

$$= \frac{1}{2}\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} (16 + 24\sin\theta + 9\sin^2\theta)\, d\theta$$

$$= \frac{1}{2}\left[16\theta - 24\cos\theta + 9\int \frac{1-\cos 2\theta}{2}\, d\theta\right]_{-\frac{\pi}{2}}^{\frac{\pi}{2}}$$

$$= \left[8\theta - 12\cos\theta + \frac{9}{4}\left(\theta - \frac{\sin 2\theta}{2}\right)\right]_{-\frac{\pi}{2}}^{\frac{\pi}{2}}$$

$$= \left[\frac{41}{4}\theta - 12\cos\theta - \frac{9}{8}\sin 2\theta\right]_{-\pi}^{\frac{\pi}{2}}$$