Answers

PPY#2

Find $a)\ \frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ b) evaluate both at t=0

1. $x = t^2 + 3t \quad y = t + 1$

① a) $\frac{dy}{dx} = \frac{1}{2t+3}$ b) $\frac{1}{3}$

$\frac{d^2y}{dx^2} = \frac{-2}{(2t+3)^3}$ $\quad \frac{-2}{27}$

Write the eqn of the tangent line to the curve at the given point.

2. $x = 2t \quad y = t^2$ at t=2
3. $x = t^2 - t + 2 \quad y = t^3 - 3t \quad at\ t = -1$

② $y - 3 = 2(x - 4)$

③ $y = 2$

Find all pts (if any) of HT and VT to the curve.

4. $x = 1 - t \quad y = t^2$
5. $x = 3cos\theta \quad y = 3sin\theta$

④ HT (1,0) VT: none

⑤ HT (0,3) (0,-3) VT (3,0) (-3,0)

Find the arclength (use fnint)

6. $x = arcsint \quad y = ln\sqrt{1-t^2} \quad 0 \le t \le \frac{1}{2}$

⑥ $\int_0^{1/2} \sqrt{\frac{1}{(1-t^2)^2}}\, dt \approx 0.549$

Find $\frac{dy}{dx}$ and evaluate it at $\theta = \frac{\pi}{2}$

7. $r = 3(1 - cos\theta)$

⑦ $\frac{dy}{dx} = \frac{(1+2\cos\theta)(1-\cos\theta)}{\sin\theta(2\cos\theta - 1)}$ @ $\theta = \frac{\pi}{2}$ $\frac{dy}{dx} = -1$

Find the area of the given region:

8. One leaf of $r = 2cos3\theta$
9. Inner loop of $r = 1 + 2cos\theta$
10. Between the loops of $r = 1 + 2cos\theta$

⑧ $2\left[\frac{1}{2}\int_0^{\pi/6} (2\cos 3\theta)^2 d\theta\right] = \frac{\pi}{3}$

⑨ $2\left[\frac{1}{2}\int_{2\pi/3}^{\pi} (1+2\cos\theta)^2 d\theta\right] = \frac{2\pi - 3\sqrt{3}}{2}$

⑩ $2\left[\frac{1}{2}\int_0^{2\pi/3} (1+2\cos\theta)^2 d\theta\right] = \frac{4\pi + 3\sqrt{3}}{2}$ outer loop

between loops answer to $\underset{\text{outer - inner}}{10 - 9} = \pi + 3\sqrt{3}$

Find the intersection points of

11. $r = 1 + cos\theta \quad and \quad r = 1 - cos\theta$

⑪ $(1, \pi/2)\ (1, 3\pi/2)\ (0,0)$

Find the arclength

12. $r = 1 + sin\theta \quad 0 \le \theta \le 2\pi$

⑫ $2\int_{\pi/2}^{3\pi/2} \sqrt{(1+\sin\theta)^2 + (\cos\theta)^2}\, d\theta = 8$

Find the a) position at time t=3, b) distance the particle travels $t \in [0,3]$ use fint

13. $v(t) = < 3t^2 - 2t, 1 + cos\pi t >$ s(0)=(2,6)

⑬ a) $\langle 20, 9 \rangle$

a) $\left\langle \int_0^3 3t^2 - 2t\, dt ; \int_0^3 1 + \cos\pi t\, dt \right\rangle + \langle 2, 6 \rangle$

b) $\int_0^3 \sqrt{(3t^2 - 2t)^2 + (1 + \cos\pi t)^2}\, dt \approx 19.343$ (fnint)