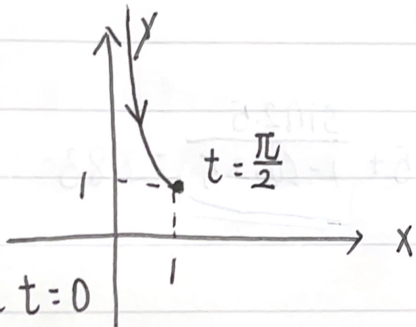
HW1: Section 9.1

1(a): $x = \sin t$

$y = \frac{1}{\sin t}$ $t \in [0, \frac{\pi}{2}]$

$xy = 1$ ($t \neq 0 \Rightarrow x \neq 0$)

(b)



when $t = 0$

$x = 0$ $\lim_{t \to 0} y = +\infty$

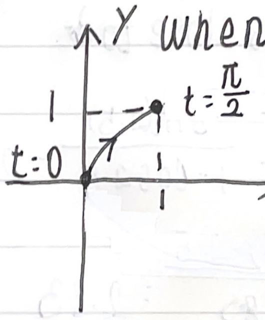
when

$t = \frac{\pi}{2}$ $x = 1$ $y = 1$

(c) $x = \sin^2 t$ $y = \sin t$

$y^2 = x$

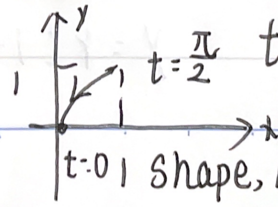
$t \in [0, \frac{\pi}{2}]$ $y \in [0, 1]$



when $t = 0$, $x = 0$ $y = 0$

when $t = \frac{\pi}{2}$ $x = 1$ $y = 1$

$t \in [\frac{\pi}{2}, \pi]$ When $t = \frac{\pi}{2}$, $x = 1$ $y = 1$



$t = \pi$. $x = 0$ $y = 0$

They have the same shape, but different positive orientation.

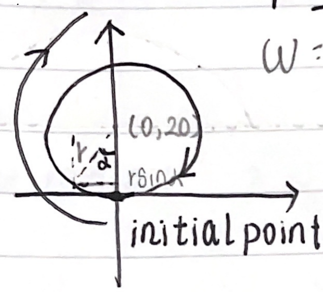
sin · csc

cos sec

Campus

HW

2.



$r = 20m \quad \alpha = \frac{3}{2}\pi - \omega t = -\frac{1}{2}\pi - \omega t$

$\omega = 2\pi/3 \ min^{-1}$

$x = 20\cos\alpha = 20\cos(-\frac{\pi}{2} - \frac{2}{3}\pi t) = -20\sin\frac{2}{3}\pi t$

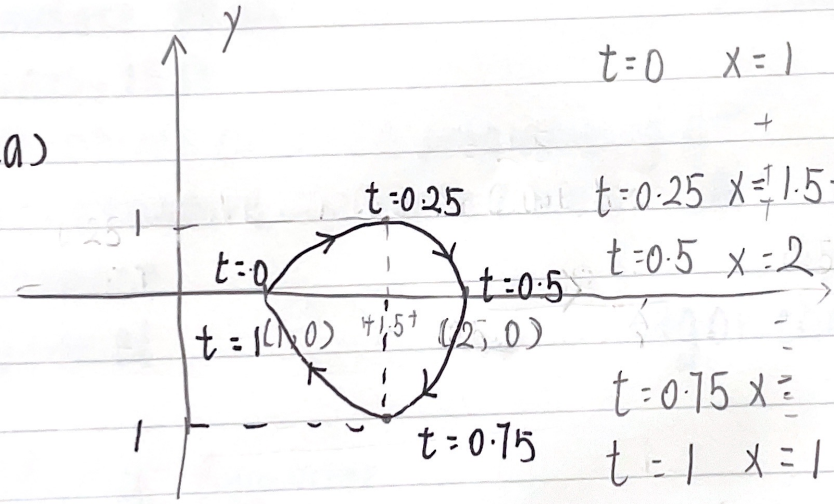
$y = 20 + 20\sin\alpha = 20 + 20\sin(-\frac{\pi}{2} - \frac{2}{3}\pi t)$

$= 20 - 20\sin(\frac{\pi}{2} + \frac{2}{3}\pi t) = 20 - 20\cos\frac{2}{3}\pi t$

$x^2 + (y-20)^2 = 20^2 \qquad t \in [0, 3]$

3.

(a)



$t=0 \quad x=1 \quad y=0$

$t=0.25 \quad x=1.5 \quad y=1$

$t=0.5 \quad x=2 \quad y=0$

$t=0.75 \quad x=$

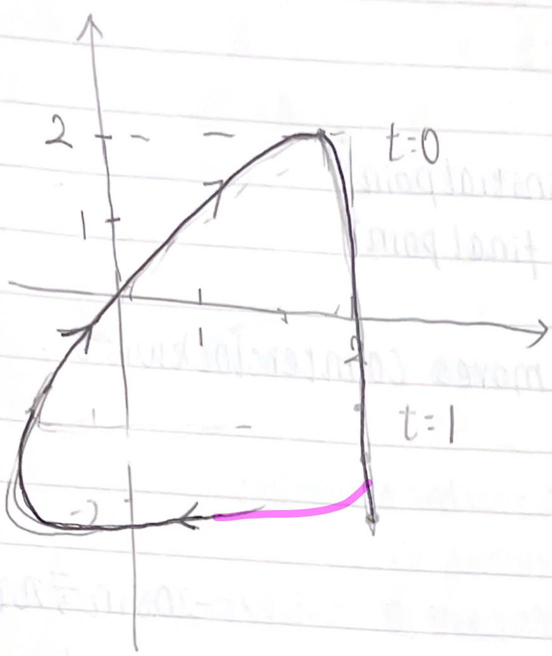
$t=1 \quad x=1 \quad y=0$

(b)

$t=2$

$t=1$

$t=0 \quad x=2^- \quad y=2$



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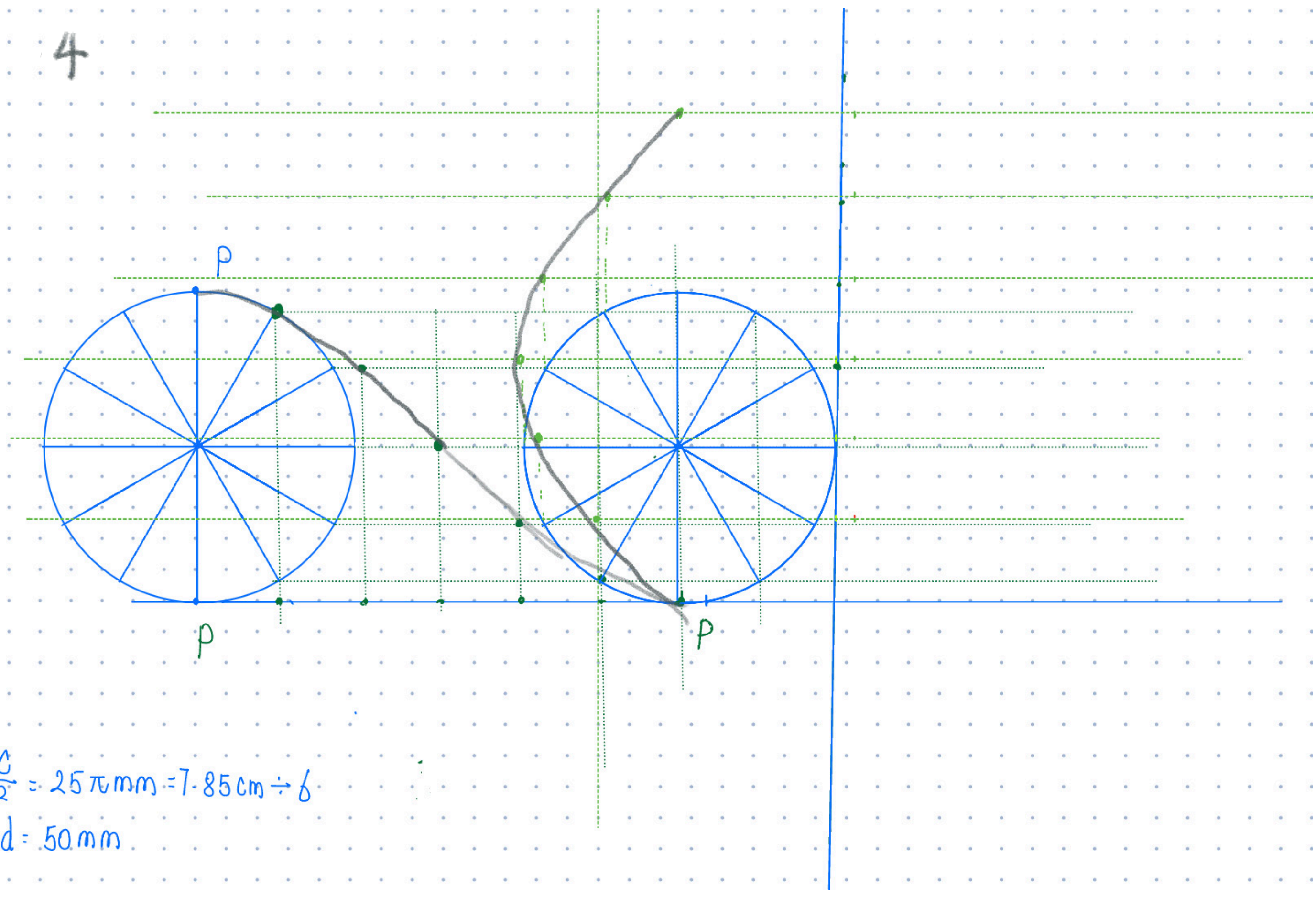


$\frac{C}{2} = 25\pi mm = 7.85 cm \div 6$

$d = 50 mm$

No.

Date

Homework 9.2

Q:23. Ex9.2

(a) $\frac{dr}{dx} = \frac{dy/d\theta}{dx/d\theta} = \frac{-d\cos\theta}{r-d\cos\theta}$

$dy/d\theta = -d\cos\theta$

$dx/d\theta = r - d\cos\theta$

(b) verticle line:

$\frac{dx}{dt} = 0$ & $\frac{dy}{dt} \neq 0$

$\begin{cases} r = d\cos\theta \\ -d\cos\theta \neq 0 \end{cases}$

$\because d < r \quad \therefore 1 < \frac{r}{d} \quad \cos\theta = \frac{r}{d}$

$\therefore$ Do not exist

There is no tangent line.

(b) ③ $\frac{dy}{d\theta} = 0 \quad \frac{dx}{d\theta} = 0$ verticle tangent

① $\cos\theta = 0 \quad \sin\theta = 1 \quad \theta = \frac{1}{2}\pi + 2n\pi$ $(0, a)$ ∞

$\lim_{\theta \to \frac{1}{2}\pi + 2n\pi} \frac{dy}{dx} = \infty \quad \sin\theta = -1 \quad \theta = -\frac{1}{2}\pi + 2n\pi$ $(0, -a)$ $-\infty$

Q24. Ex9.2

(a) $dx/d\theta = a3\cos^2\theta(-\sin\theta)$ ② $\sin\theta = 0 \quad \cos\theta = \pm 1$ horizonal

$dy/d\theta = a3\sin^2\theta\cos\theta$

$\frac{dy}{dx} = \frac{\sin\theta}{-\cos\theta} = -\tan\theta$

(b)可以用(a) $\frac{dy}{dx} = -\tan\theta$ 的结论

At points $(\pm a, 0)$ is the tangent horizontal, $(0, \pm a)$ is the tangent vertic[al]

(b) point:

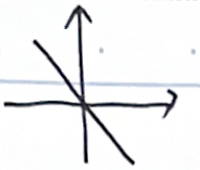
① horizontal: $\frac{dy}{d\theta} = 0 \quad \frac{dx}{d\theta} \neq 0$ ② verticle: $\frac{dx}{d\theta} = 0 \quad \frac{dy}{d\theta} \neq 0$

$3a\cos^2\theta(-\sin\theta) = 0$ There is no point

$3a\sin^2\theta\cos\theta \neq 0$ ③ When $\theta = n\pi$ (n is an integer)

$\lim_{\theta \to n\pi} \frac{dy}{dx} = \frac{0}{\pm 1} = 0$ horizontal: $\cos\theta = \pm 1 \mid \sin\theta = 0$

KOKUYO



(c): $-\tan\theta = 1$ $\qquad$ $-\tan\theta = -1$ $\quad$ slope $=1$

$\tan\theta = -1$: slope $\qquad\qquad$ $\theta = \frac{\pi}{4} + n\pi$ (n is an integer)

$\theta = -\frac{\pi}{4} + n\pi$ (n is an integer)

$\begin{cases} \cos\theta = -\frac{\sqrt{2}}{2} \\ \sin\theta = \frac{\sqrt{2}}{2} \end{cases}$ or $\begin{cases} \cos\theta = \frac{\sqrt{2}}{2} \\ \sin\theta = -\frac{\sqrt{2}}{2} \end{cases}$ $\qquad$ $\begin{cases} \cos\theta = \frac{\sqrt{2}}{2} \\ \sin\theta = \frac{\sqrt{2}}{2} \end{cases}$ $\begin{cases} \cos\theta = -\frac{\sqrt{2}}{2} \\ \sin\theta = -\frac{\sqrt{2}}{2} \end{cases}$

$(\frac{\sqrt{2}}{4}a, \frac{\sqrt{2}}{4}a)$ $\quad$ $(-\frac{\sqrt{2}}{4}a, -\frac{\sqrt{2}}{4}a)$

$x = -a\frac{\sqrt{2}}{4}$ $\qquad$ $x = a\frac{\sqrt{2}}{4}$

$y = a\frac{\sqrt{2}}{4}$ $\qquad$ $y = -a\frac{\sqrt{2}}{4}$

$(-\frac{\sqrt{2}}{4}a, \frac{\sqrt{2}}{4}a)$ $\qquad$ $(\frac{\sqrt{2}}{4}a, -\frac{\sqrt{2}}{4}a)$

3. $x = a\cos^3\theta$ $\quad$ $dx/d\theta = a3\cos^2\theta(-\sin\theta)$

$y = a\sin^3\theta$ $\quad$ $dy/d\theta = 3a\sin^2\theta\cos\theta$

$S = \int_0^{\frac{\pi}{2}} 2\pi a\sin^3\theta \sqrt{1+\tan^2\theta} \; |3a\cos^2\theta(-\sin\theta)| d\theta$

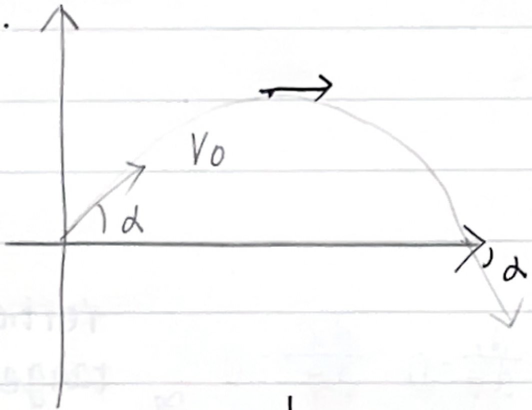
$= 6\pi a^2 \int_0^{\frac{\pi}{2}} (-\sin^4\theta)\cos\theta \, d\theta$

$u = \sin\theta$ $\qquad$ $= 6\pi a^2 \int_0^1 -u^4 du$

$du = \cos\theta d\theta$ $\qquad$ $= 6\pi a^2 \cdot -\frac{1}{5}u^5 \Big|_0^1 = -\frac{6}{5}\pi a^2$

$|S| = \frac{6}{5}\pi a^2$

2.



(a) $y = 0$: $\Rightarrow$ $\frac{1}{2}gt^2 = V_0\sin\alpha t$

$t = \frac{2V_0\sin\alpha}{g}$

$V_x = dx/dt = V_0\cos\alpha$

$V_y = dy/dt = V_0\sin\alpha - gt$

$= -V_0\sin\alpha$

$V = V_0$

第二题最好用数学的方法解答

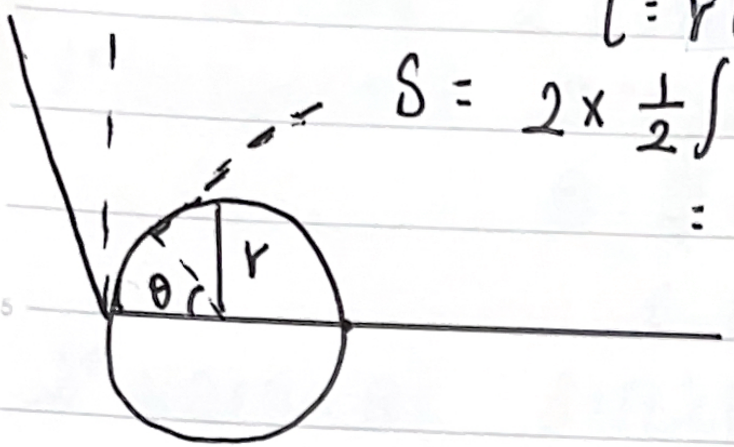
下次这样写会扣分.

(b) $V = V_0\cos\alpha$

No.

$S = \frac{1}{2}\theta r^2$ $\quad l = \theta r$

HW3: 9.2



rope: πr

$l = r(\pi - \theta)$

$$S = 2 \times \frac{1}{2}\int_0^{\pi} r^2(\pi-\theta)^2\, d\theta + \frac{1}{2}\pi(\pi r)^2$$

$$= \frac{5}{6}\pi^3 r^2$$