April 8th

MATH: Polar coordinates

quiz recap

① $x^3 \sin x = x^4 - \frac{x^6}{3!} + \frac{x^8}{5!} - \frac{x^{10}}{7!} \cdots$

② $\sin(x^3) = x^3 - \frac{x^9}{3!} + \frac{x^{15}}{5!} - \frac{x^{21}}{7!} \cdots$

③ $3x^2 \cos(x^3) = 3x^2 - \frac{9x^8}{3!} + \frac{15x^{14}}{5!} - \frac{21x^{20}}{7!} \cdots$

④ $c(t) = (2+t^2, 3-t^3)$ $\quad (3,2) \to t=1$

$y - 2 = -\frac{3}{2}(x-3)$

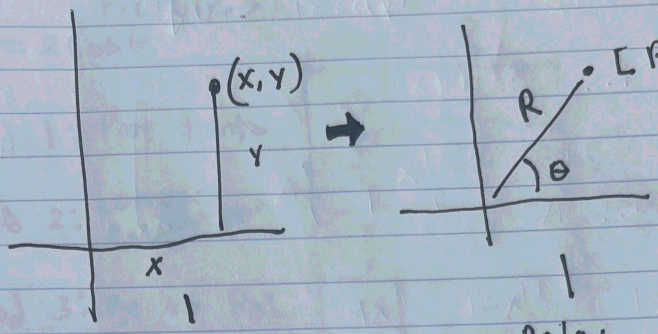
⑤ speed $= \frac{ds}{dt} = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} = \sqrt{4t^2+9t^4}$ $\quad$ at $t=2$

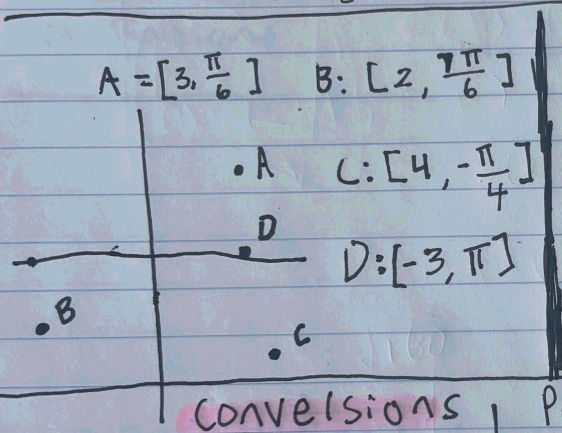
$= \sqrt{160}$

⑥ Arclength $\int_0^1 \sqrt{4t^2+9t^4}\, dt = \int_0^1 t\sqrt{4+9t^2}\, dt$

$\frac{1}{27} = (13\frac{3}{2} - 8)$

MATH: POLAR COORDinates





A = $[3, \frac{\pi}{6}]$ B: $[2, \frac{7\pi}{6}]$

C: $[4, -\frac{\pi}{4}]$

D: $[-3, \pi]$

E: $[3, \frac{\pi}{4}]$

F: $[3, \frac{9\pi}{4}]$

G: $[-3, \frac{5\pi}{4}]$

H: $[3, \frac{33\pi}{4}]$

infinite nombes

E, F, G, H, ...

Points

Convelsions

equations

Rect → Polar

$x^2 + y^2 = 9 \rightarrow (R\cos\theta)^2 + (R\sin\theta)^2 = 9$

↳ Exp $R = 3$

$2x + 3y = 7 \rightarrow y = \frac{-2x+7}{3}$

$2(R\cos\theta) + 3(R\sin\theta) = 7$

$R = \frac{7}{(2\cos\theta) + 3\sin\theta}$

Polar → Rect

↳ Exp $R = 2\cos\theta$

$R^2 = 2R\cos\theta$

$x^2 + y^2 = 2x$

} a lot of times its not possible tho

Circles are much esier to express in Polar while streight lines are esier in rectangular

Polar → Rectangular $[R, \theta] \rightarrow (x, y)$

$x = R\cos\theta \quad y = R\sin\theta$

Rectangular → Polar $(x, y) \rightarrow [R, \theta]$

$R = \sqrt{x^2 + y^2}$

~~$\theta = \arctan\frac{y}{x}$~~

arctan doesnt work

$\theta^* = \text{Arctan}\frac{y}{x}$

* means adjust for the quadrant

For quad II, III add π

MATH Polar Coordinates

Exp Pictures:

$R = 2\cos\theta$

Method 1: Plot Points

Method 2: convert equation

Method 3: go to POL mode calculator in Radians

θ	R
0	2
$\frac{\pi}{4}$	$\sqrt{2}$
$\frac{\pi}{2}$	0
$\frac{3\pi}{4}$	$-\sqrt{2}$
π	-2