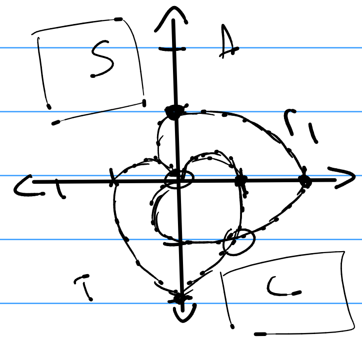
Math 243

$\boxed{\text{Q's}}$

10.4

$r_1 = 1 + \cos\theta$

$r_2 = 1 - \sin\theta$



$1 + \cos\theta = 1 - \sin\theta$

$\cos\theta = -\sin\theta$

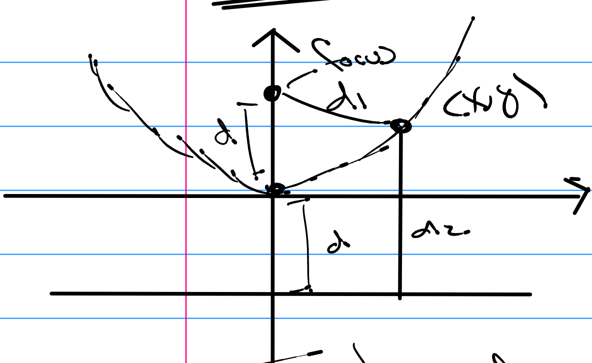
$\theta = \frac{3}{4}\pi, -\frac{1}{4}\pi$

$r_1 = 0 \rightarrow \theta = \pi$

$r_2 = 0 \rightarrow \theta = \pi/2$

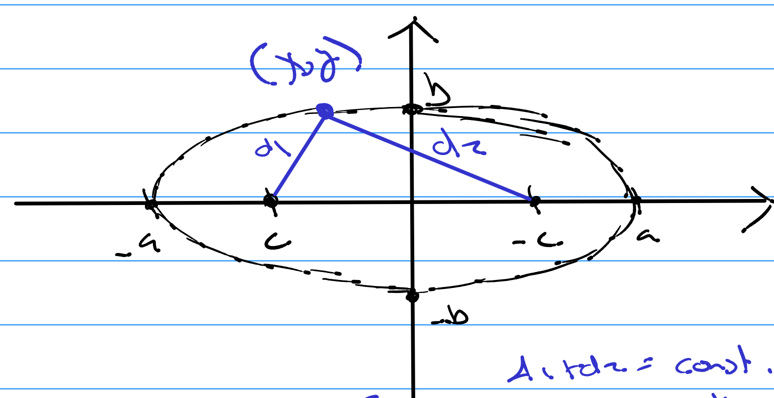
Conic Sections

Cartesian



$\boxed{\text{parabola}}$ $d_1 = d_2$

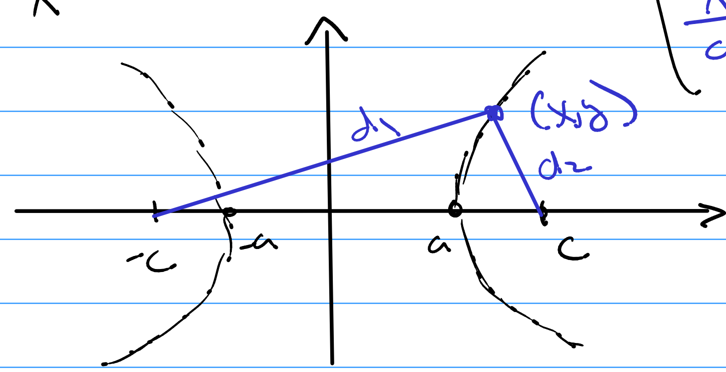
$$y = \frac{1}{4d}x^2$$



$d_1 + d_2 = \text{const.} = 2a$

$c^2 = a^2 - b^2$

$$\boxed{\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1}$$

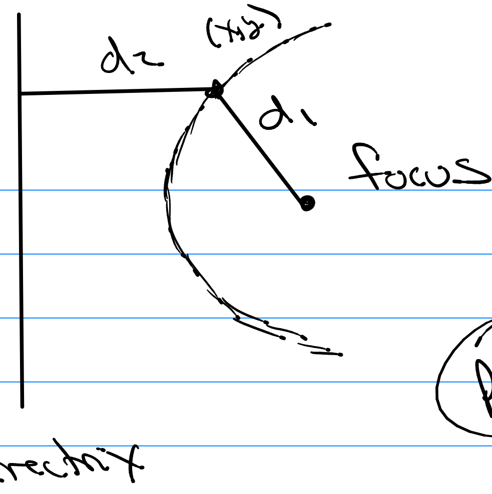


$c^2 = a^2 + b^2$

$d_1 - d_2 = \pm 2a$

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

$\boxed{\text{or}}$



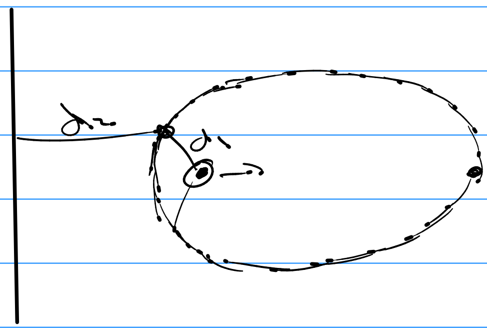
consider ratio of $\frac{d_1}{d_2}$

parabola: (before $d_1 = d_2$)

↳ now $\frac{d_1}{d_2} = 1$

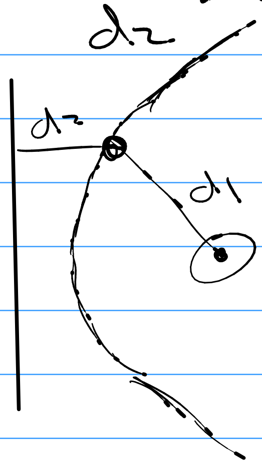
$\boxed{?Q?}$ what if $\frac{d_1}{d_2} \neq 1$

$\boxed{Q\#1}$ $0 < \frac{d_1}{d_2} < 1 \to d_1 < d_2$



ellipse?

$\boxed{Q\#2}$ $\frac{d_1}{d_2} > 1 \to d_1 > d_2$

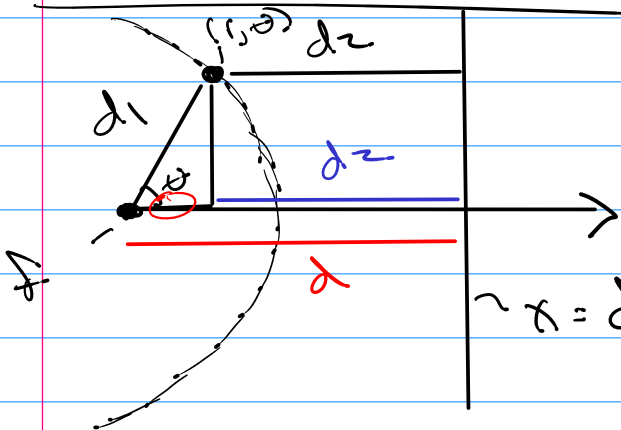


hyperbola?

Maybe use polar coord.

Constant

$$\boxed{\frac{d_1}{d_2} = e > 0}$$



$d_1 = r$

$d_2 = d - r\cos\theta$

all conic sections are $\frac{d_1}{d_2} = e \to \boxed{\frac{r}{d - r\cos\theta} = e}$

Solve for r?

$r = ed - er\cos\theta$

$r + er\cos\theta = ed$

polar eqn's of conics

$$\boxed{r = \frac{ed}{1 + e\cos\theta}}$$

One eqn for all conic sections

Prove this is ellipse for $0 < e < 1$?

$r = \frac{ed}{1 + e\cos\theta} \to$ x's y's eqn

$r + er\cos\theta = ed$

$r = ed - e\underbrace{r\cos\theta}_{x}$

$$(r)^2 = (e(d-x))^2$$

$$r^2 = e^2(d-x)^2$$

$$x^2+y^2 = e^2(d-x)^2$$

$$x^2+y^2 = e^2(d^2-2dx+x^2)$$

$$\boxed{x^2-e^2x^2+2de^2x} + y^2 = e^2d^2$$

$(1-e^2)x^2$

$$\frac{(x-\ )^2}{?\ e^2d^2} + \frac{y^2}{e^2d^2} = 1$$