Math 112

Q's Parabola $4p(y-k) = (x-h)^2$

x^2? y? $(4p)y$

pos? neg?

$4p(x-h) = (y-k)^2$

y^2? x? $(4p)x$

pos? neg?

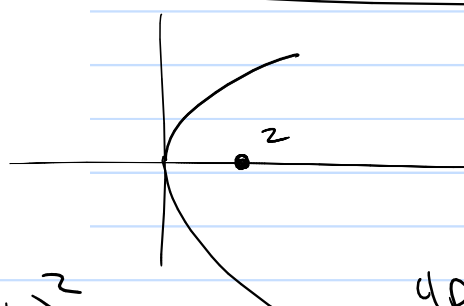
Match the equations with their graphs. Enter the letter of the graph below which corresponds to the equation. (**Click on image for a larger view**)

	1. $y^2 - 8x = 0$
	2. $x^2 = 16y$
	3. $x = -8y^2$
	4. $4x + y^2 = 0$

$\rightarrow 8x = y^2$

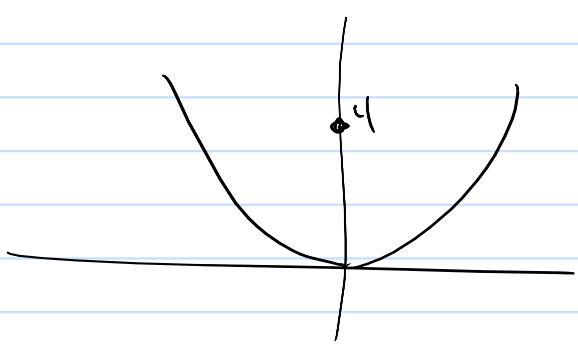
$\boxed{4p(x-h) = (y-k)^2}$

(1)



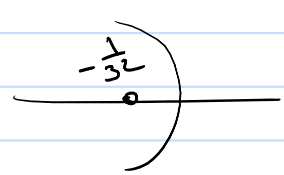
$4p = -\frac{1}{8}$

(2) $16y = x^2$ $4p(y-k) = (x-h)^2$

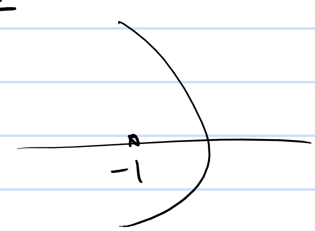


(3) $x = -8y^2$

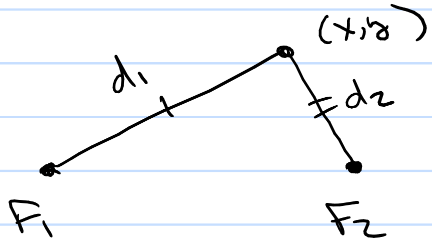
$-\frac{1}{8}x = y^2$

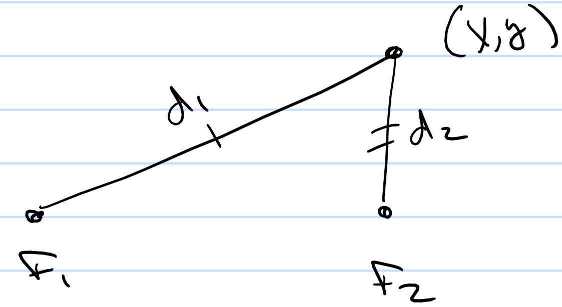


(4) $-4x = y^2$



Ellipse / Hyperbola



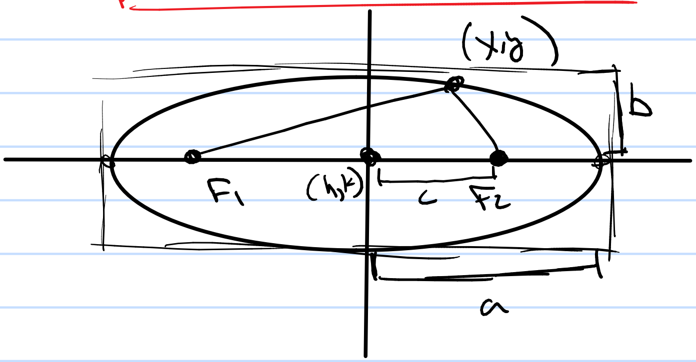


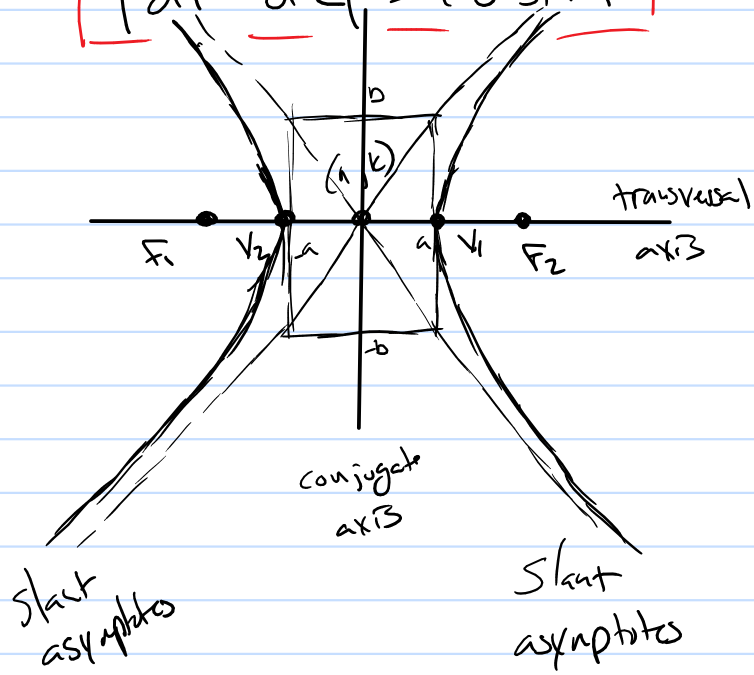
ellipse

$\boxed{d_1 + d_2 = \text{constant}}$

hyperbola

$\boxed{|d_1 - d_2| = \text{constant}}$



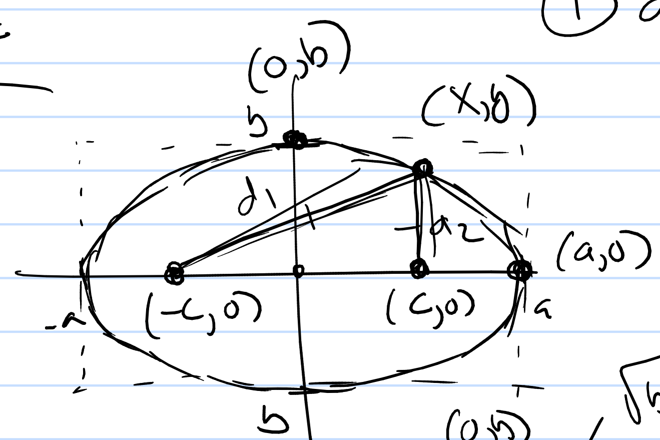


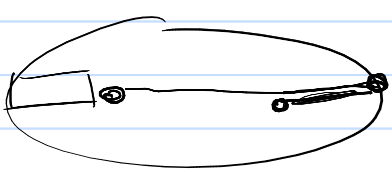
Algebra Skills?!

① $d_1 + d_2 = \text{const}$

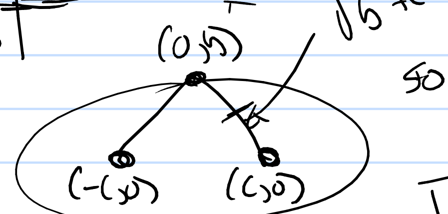
$= \boxed{2a}$

ellipse





②



$\sqrt{b^2+c^2}$

so $\sqrt{b^2+c^2} = a$

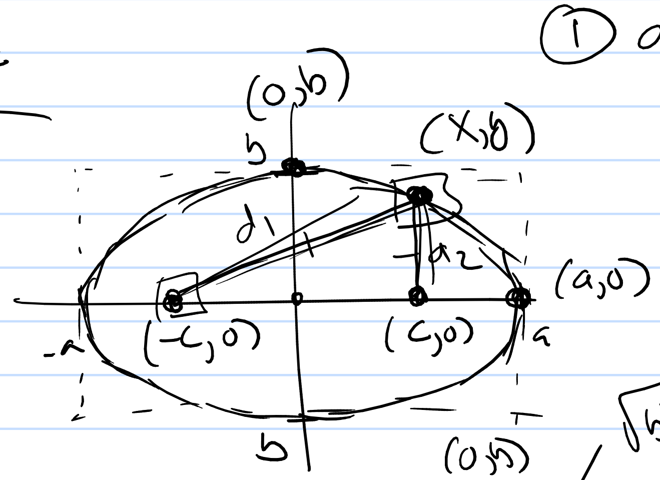
or $\boxed{a^2 = b^2 + c^2}$

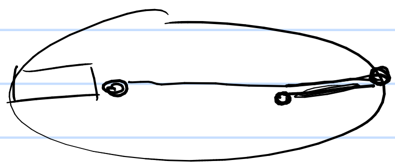
so ① $\boxed{\text{constant} = 2a}$ ② $\boxed{a^2 = b^2 + c^2}$

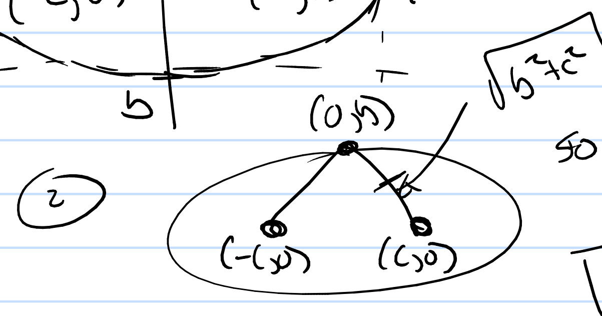
Algebra Skills?!

ellipse

① $d_1 + d_2 = \text{const} = \boxed{2a}$







so $\sqrt{b^2+c^2} = a$

or $\boxed{a^2 = b^2 + c^2}$

③ (x,y)?

$$\underbrace{\sqrt{(x+c)^2 + y^2}}_{\text{distance from } (x,y) \text{ to } (-c,0)} + \underbrace{\sqrt{(x-c)^2 + y^2}}_{\text{distance from } (x,y) \text{ to } (c,0)} = 2a$$

How is your Algebra?

Note: $\boxed{a^2 = b^2 + c^2}$

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

$$\sqrt{(x+c)^2+y^2} + \sqrt{(x-c)^2+y^2} = 2a$$

$$\left(\sqrt{(x+c)^2+y^2}\right)^2 = \left(2a - \sqrt{(x-c)^2+y^2}\right)^2$$

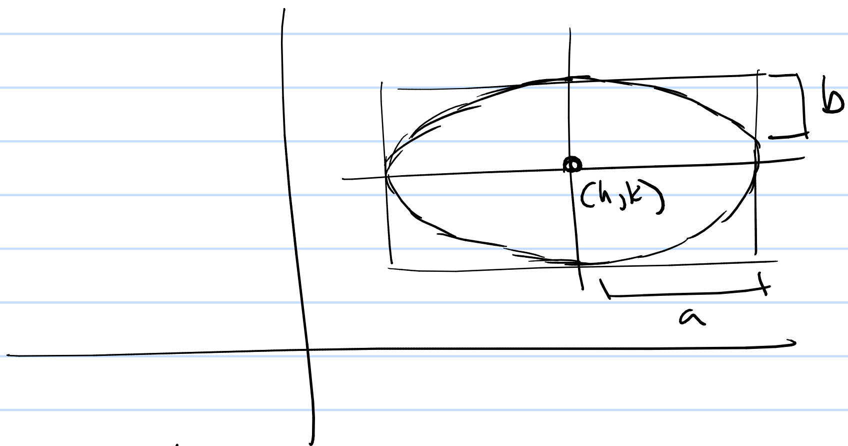
$$(x+c)^2 + \cancel{y^2} = 4a^2 - 4a\sqrt{(x-c)^2+y^2} + (x-c)^2 + \cancel{y^2}$$

$$(x+c)^2 - (x-c)^2 - 4a^2 = -4a\sqrt{(x-c)^2+y^2}$$

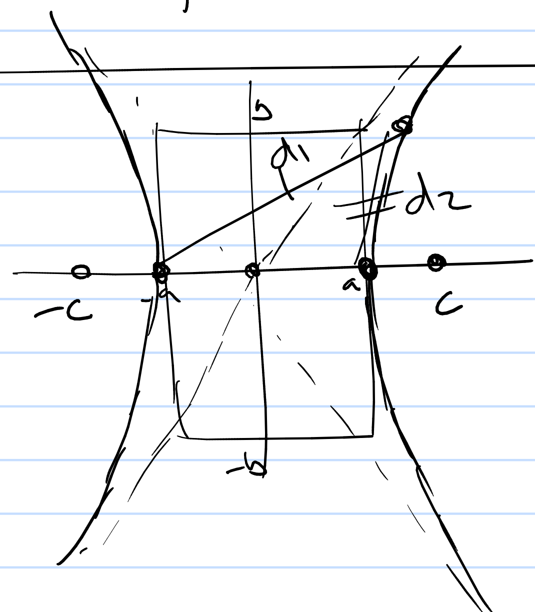
Continue!

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

ellipse $\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$



hyperbola



① $|d_1 - d_2| = \text{const}$

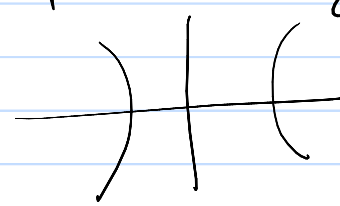
$= 2a$

② $c^2 = a^2 + b$

③ $\sqrt{(x+c)^2 + y^2} - \sqrt{(x-c)^2 + y^2} = 2a$

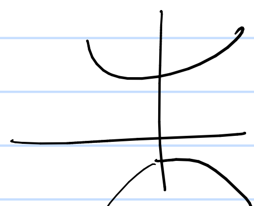
$$\boxed{\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1}$$

opens left / right



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

opens up/down



hyperbola

$$\frac{(x-h)^2}{a^2} - \frac{(y-k)^2}{b^2} = 1 \quad \text{or} \quad \frac{(y-k)^2}{b^2} - \frac{(x-h)^2}{a^2} = 1$$