

The equation for hyperbola when the two focal points are $(k, 0)$, $(-k, 0)$ and the difference in length is given by $2a$

두 초점이 $(k, 0)$, $(-k, 0)$ 이고 길이의 차이가 $2a$ 로 주어졌을 때 쌍곡선의 방정식

(The equation for hyperbola when the two focal points are $(k, 0)$, $(-k, 0)$ and the difference in length is given by $2a$)

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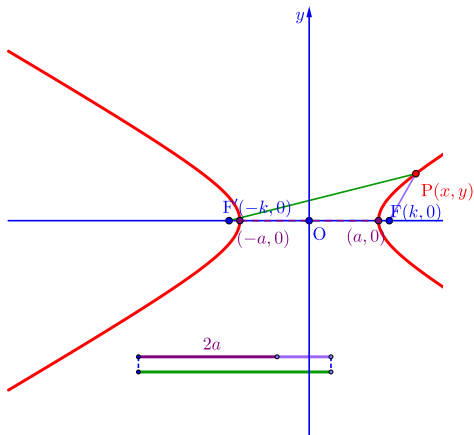
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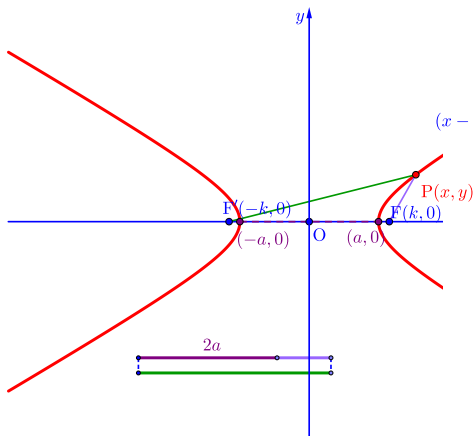


$$\begin{aligned} \left| \sqrt{(x-k)^2 + y^2} - \sqrt{(x+k)^2 + y^2} \right| &= 2a \\ \sqrt{(x-k)^2 + y^2} - \sqrt{(x+k)^2 + y^2} &= \pm 2a \\ \sqrt{(x-k)^2 + y^2} &= \sqrt{(x+k)^2 + y^2} \pm 2a \end{aligned}$$

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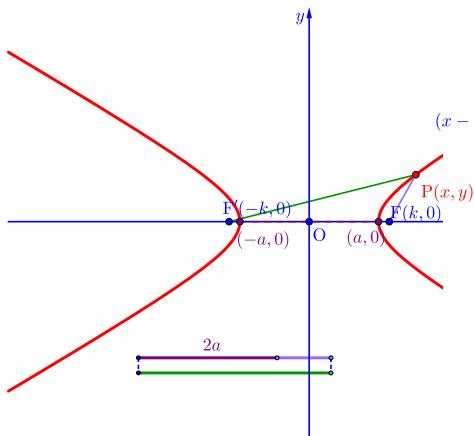


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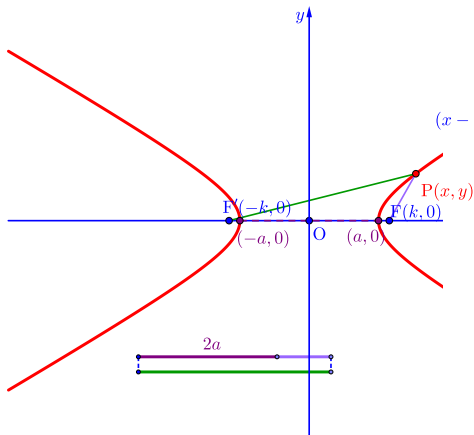


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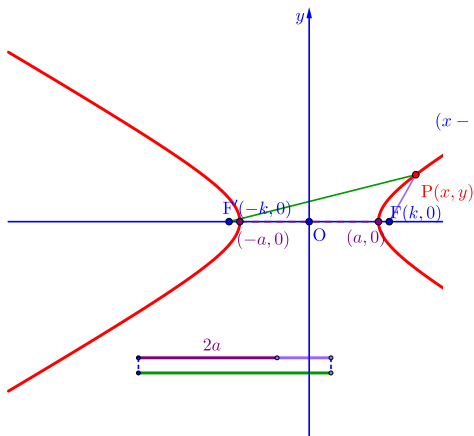


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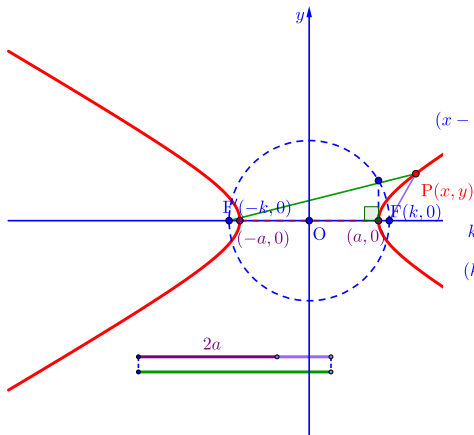


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$$-4kx - 4a^2 = \pm 4a\sqrt{(x+k)^2 + y^2}$$

$$-kx - a^2 = \pm a\sqrt{(x+k)^2 + y^2}$$

$$k^2x^2 + 2a^2kx + a^4 = a^2x^2 + 2a^2kx + a^2k^2 + a^2y^2$$

$$(k^2 - a^2)x^2 - a^2y^2 = a^2(k^2 - a^2)$$

$$\text{Let } b^2 = k^2 - a^2$$

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

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Github:

<https://min7014.github.io/math20200605001.html>

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