

아폴로니우스의 원
(Circle of Apollonius)

Circle of Apollonius

▶ Start

▶ End

Circle of Apollonius

▶ Start

▶ End

•
 $A(x_1, y_1)$

Circle of Apollonius

▶ Start

▶ End

•
 $A(x_1, y_1)$

•
 $B(x_2, y_2)$

Circle of Apollonius

▶ Start

▶ End

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

•
A(x_1, y_1)

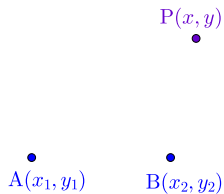
•
B(x_2, y_2)

Circle of Apollonius

▶ Start

▶ End

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

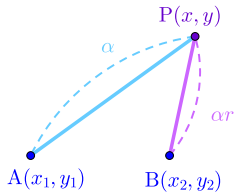


Circle of Apollonius

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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

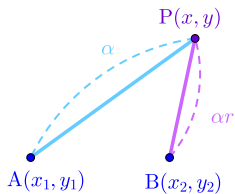


▶ Start

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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$\overline{BP} = r\overline{AP}$$

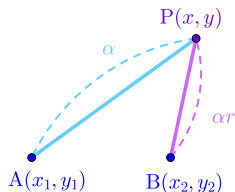


▶ Start

▶ End

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$\sqrt{(x - x_2)^2 + (y - y_2)^2} = r \sqrt{(x - x_1)^2 + r^2(y - y_1)^2}$$



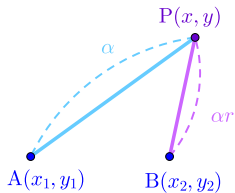
Circle of Apollonius

▶ Start

▶ End

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$(x - x_2)^2 + (y - y_2)^2 = r^2(x - x_1)^2 + r^2(y - y_1)^2$$



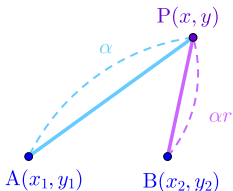
Circle of Apollonius

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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$x^2 - 2x_2x + x_2^2 + y^2 - 2y_2y + y_2^2 = r^2x^2 - 2r^2x_1x + r^2x_1^2 + r^2y^2 - 2r^2y_1y + r^2y_1^2$$



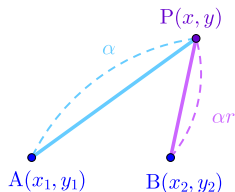
Circle of Apollonius

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▶ End

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$(1 - r^2)x^2 + (1 - r^2)y^2 - 2(x_2 - x_1r^2)x - 2(y_2 - y_1r^2)y + (x_2^2 + y_2^2 - x_1^2r^2 - y_1^2r^2) = 0$$

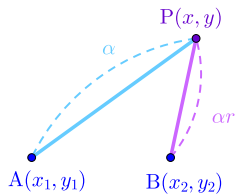


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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

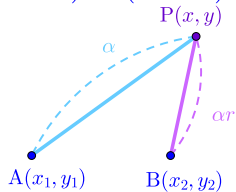
$$x^2 + y^2 - 2 \frac{x_2 - x_1 r^2}{1 - r^2} x - 2 \frac{y_2 - y_1 r^2}{1 - r^2} y + \frac{x_2^2 + y_2^2 - r^2 x_1^2 - r^2 y_1^2}{1 - r^2} = 0$$



[▶ Start](#)[▶ End](#)

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$\begin{aligned} &\left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 \\ &= \left(\frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(\frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 - \frac{x_2^2 + y_2^2 - r^2 x_1^2 - r^2 y_1^2}{1 - r^2} \end{aligned}$$

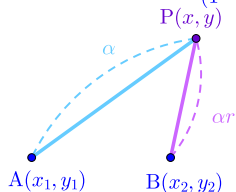


Circle of Apollonius

▶ Start

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$$\begin{aligned}\overline{AP} : \overline{BP} &= 1 : r \quad (0 < r < 1) \\ \left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 \\ &= \frac{(x_2 - x_1 r^2)^2 + (y_2 - y_1 r^2)^2 - (x_2^2 + y_2^2 - r^2 x_1^2 - r^2 y_1^2)(1 - r^2)}{(1 - r^2)^2}\end{aligned}$$

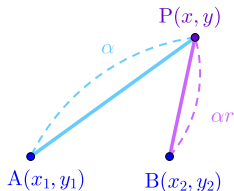


Circle of Apollonius

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$$\begin{aligned}
 \overline{AP} : \overline{BP} &= 1 : r \quad (0 < r < 1) \\
 \left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 &+ \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 \\
 = \frac{x_2^2 - 2x_1 x_2 r^2 + x_1^2 r^4 + y_2^2 - 2y_1 y_2 r^2 + y_1^2 r^4 - (x_2^2 + y_2^2 - x_1^2 r^2 - y_1^2 r^2)(1 - r^2)}{(1 - r^2)^2}
 \end{aligned}$$



Circle of Apollonius

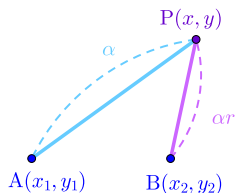
▶ Start

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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$\left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2$$

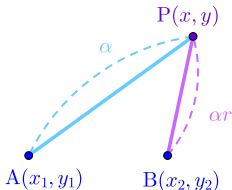
$$= \frac{x_2^2 - 2x_1 x_2 r^2 + x_1^2 r^4 + y_2^2 - 2y_1 y_2 r^2 + y_1^2 r^4 - x_2^2 - y_2^2 + x_1^2 r^2 + y_1^2 r^2 + x_2^2 r^2 + y_2^2 r^2 - x_1^2 r^4 - y_1^2 r^4}{(1 - r^2)^2}$$



▶ Start

▶ End

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$
$$\left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 = \frac{-2x_1 x_2 r^2 - 2y_1 y_2 r^2 + x_1^2 r^2 + y_1^2 r^2 + x_2^2 r^2 + y_2^2 r^2}{(1 - r^2)^2}$$

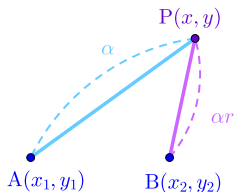


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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

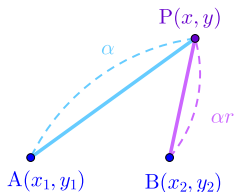
$$\left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 = \frac{x_1^2 r^2 - 2x_1 x_2 r^2 + x_2^2 r^2 + y_1^2 r^2 - 2y_1 y_2 r^2 + y_2^2 r^2}{(1 - r^2)^2}$$



▶ Start

▶ End

$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$
$$\left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 = \frac{(x_1^2 - 2x_1 x_2 + x_2^2)r^2 + (y_1^2 - 2y_1 y_2 + y_2^2)r^2}{(1 - r^2)^2}$$



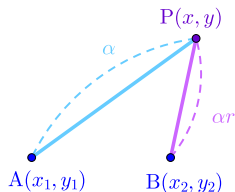
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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$\left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 = \frac{(x_1 - x_2)^2 r^2 + (y_1 - y_2)^2 r^2}{(1 - r^2)^2}$$



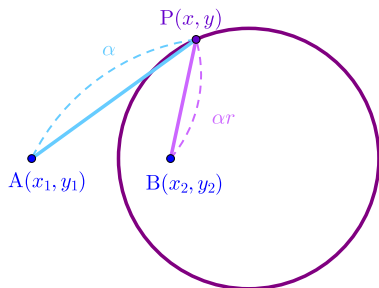
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$$\overline{AP} : \overline{BP} = 1 : r \quad (0 < r < 1)$$

$$\left(x - \frac{x_2 - x_1 r^2}{1 - r^2}\right)^2 + \left(y - \frac{y_2 - y_1 r^2}{1 - r^2}\right)^2 = \frac{(x_1 - x_2)^2 r^2 + (y_1 - y_2)^2 r^2}{(1 - r^2)^2}$$



Github:

<https://min7014.github.io/math20210915001.html>

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and you can see a picture moving.