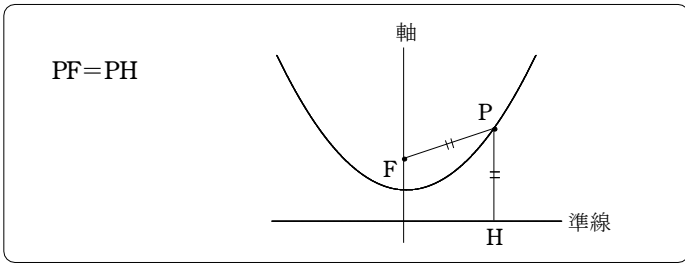


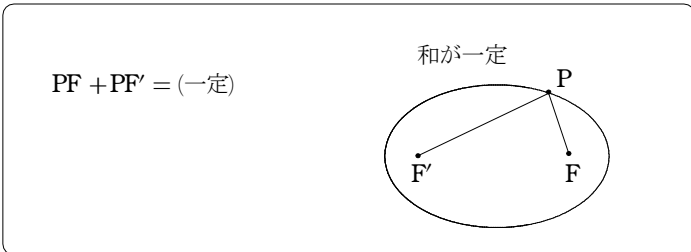
式と曲線① (公式)

放物線



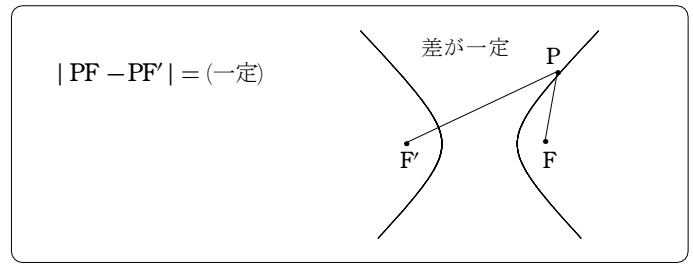
標準形	$y^2 = 4px$	$x^2 = 4qy$
焦点	$F(p, 0)$	$F(0, q)$
準線	$x = -p$	$y = -q$
グラフ		
頂点	原点	原点

楕円



標準形	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad (a > b)$	$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \quad (a < b)$
焦点	$F(\sqrt{a^2 - b^2}, 0)$ $F'(-\sqrt{a^2 - b^2}, 0)$	$F(0, \sqrt{b^2 - a^2})$ $F'(0, -\sqrt{b^2 - a^2})$
グラフ		
	$PF + PF' = 2a$	$PF + PF' = 2b$
軸	長軸 $2a$ 短軸 $2b$	長軸 $2b$ 短軸 $2a$

双曲線



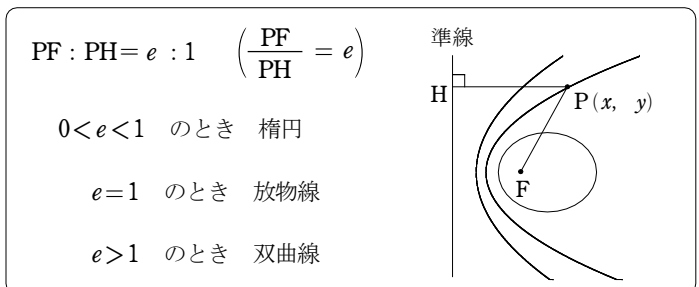
標準形	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$
焦点	$F(\sqrt{a^2 + b^2}, 0)$ $F'(-\sqrt{a^2 + b^2}, 0)$	$F(0, \sqrt{a^2 + b^2})$ $F'(0, -\sqrt{a^2 + b^2})$
グラフ		
	$PF - PF' = 2a$	$PF - PF' = 2b$
頂点	$(a, 0)$ $(-a, 0)$	$(0, b)$ $(0, -b)$
漸近線	$y = \pm \frac{b}{a}x \quad \left( \frac{x^2}{a^2} - \frac{y^2}{b^2} = 0 \text{ より} \right)$	

接線の方程式

接点  $(x_1, y_1)$  における接線の方程式は

2次曲線	接線の方程式
放物線 $y^2 = 4px$	$y_1 y = 2p(x + x_1)$
楕円 $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	$\frac{x_1 x}{a^2} + \frac{y_1 y}{b^2} = 1$
双曲線 $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	$\frac{x_1 x}{a^2} - \frac{y_1 y}{b^2} = 1$

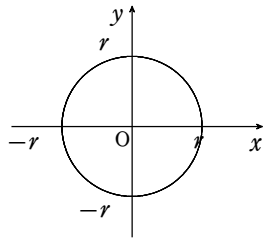
離心率  $e$



媒介変数表示

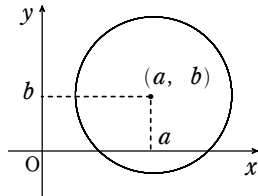
① 円  $x^2 + y^2 = r^2$

$$\begin{cases} x = r \cos \theta \\ y = r \sin \theta \end{cases}$$



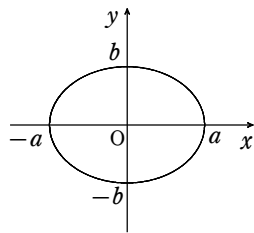
円  $(x-a)^2 + (y-b)^2 = r^2$

$$\begin{cases} x = a + r \cos \theta \\ y = b + r \sin \theta \end{cases}$$



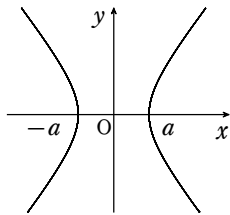
② 楕円  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

$$\begin{cases} x = a \cos \theta \\ y = b \sin \theta \end{cases}$$



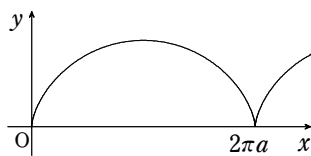
③ 双曲線  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

$$\begin{cases} x = \frac{a}{\cos \theta} \\ y = b \tan \theta \end{cases}$$



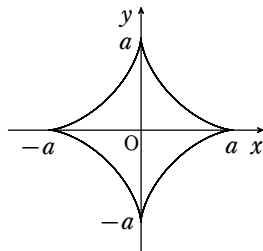
④ サイクロイド

$$\begin{cases} x = a(\theta - \sin \theta) \\ y = a(1 - \cos \theta) \end{cases}$$

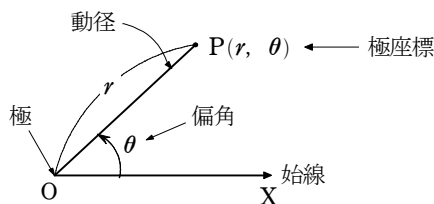


⑤ アステロイド(星芒形)

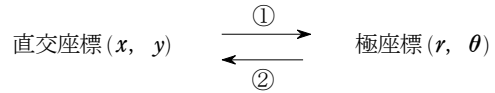
$$\begin{cases} x = a \cos^3 \theta \\ y = a \sin^3 \theta \end{cases}$$



極座標



直角座標と極座標



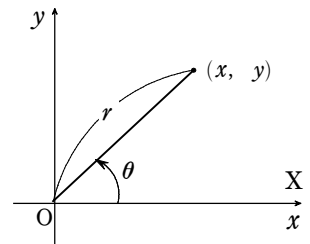
①  $x = r \cos \theta$

$y = r \sin \theta$

②  $\cos \theta = \frac{x}{r}$

$\sin \theta = \frac{y}{r}$

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

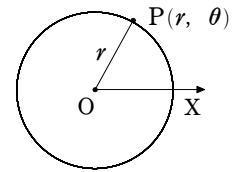


極方程式(円と直線)

① 中心が極 O, 半径 a の円

OP = r より

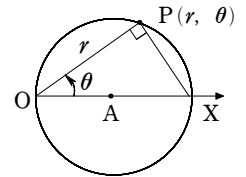
$r = 2a$



② 中心が A(a, 0), 半径 a の円

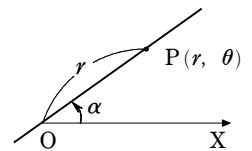
$\cos \theta = \frac{OP}{2OA}$  より

$r = 2a \cos \theta$



③ 極 O を通り, 始線と alpha の角をなす直線

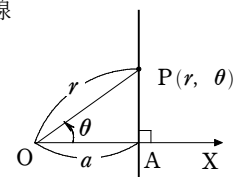
$\theta = \alpha$



④ A(a, 0) を通り, 始線に垂直な直線

$\cos \theta = \frac{OA}{OP}$  より

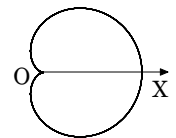
$r = \frac{a}{\cos \theta}$



極方程式

① カージオイド(心臓形)

$r = a(1 + \cos \theta)$



② レムニスケート(連珠形)

$r^2 = a^2 \cos 2\theta$

直角座標  $(x^2 + y^2)^2 = x^2 - y^2$

