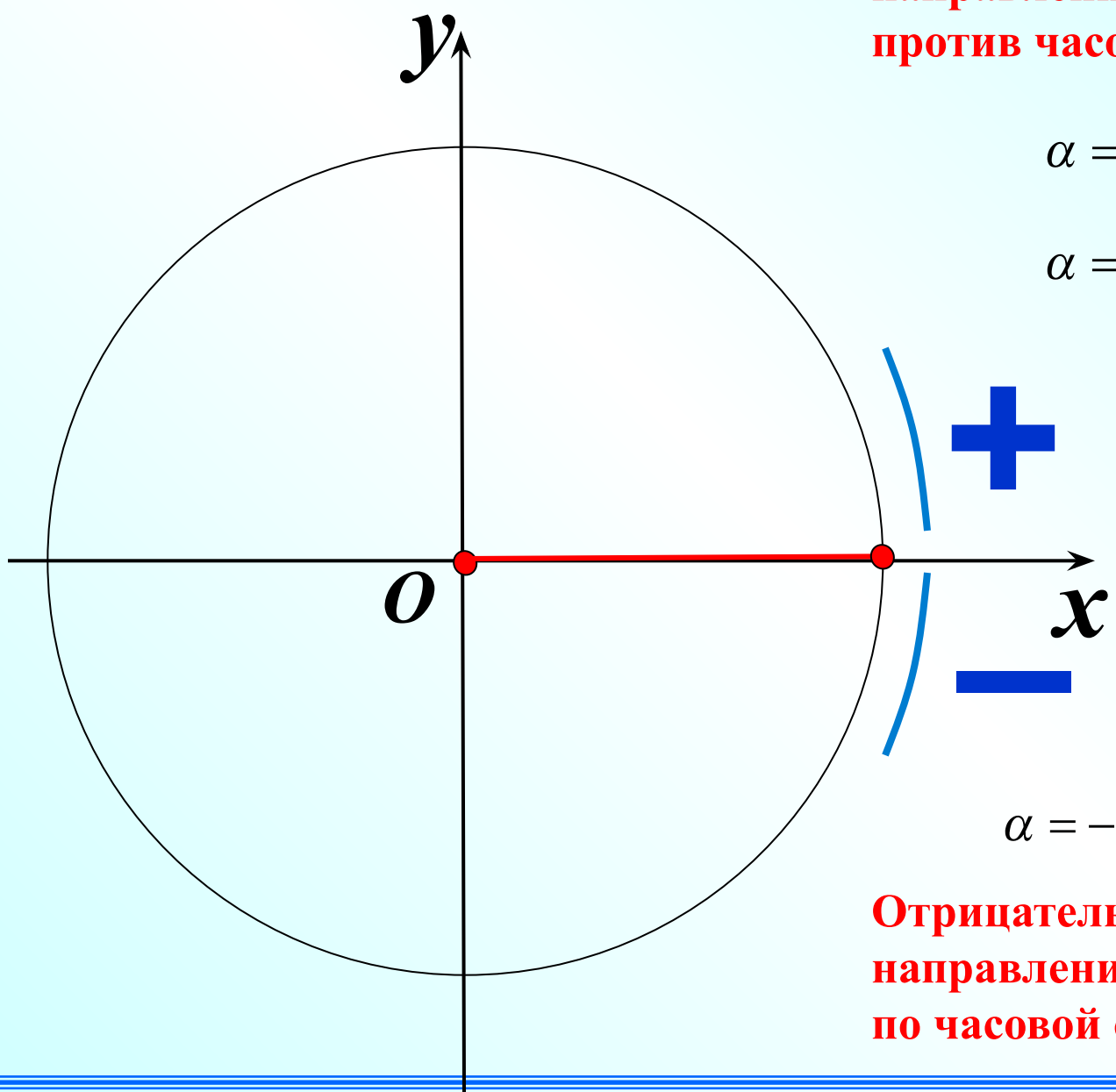
Синус, косинус и тангенс угла

Положительное направление поворота: против часовой стрелки.

$$\alpha = 47^0$$

$$\alpha = 497^0$$

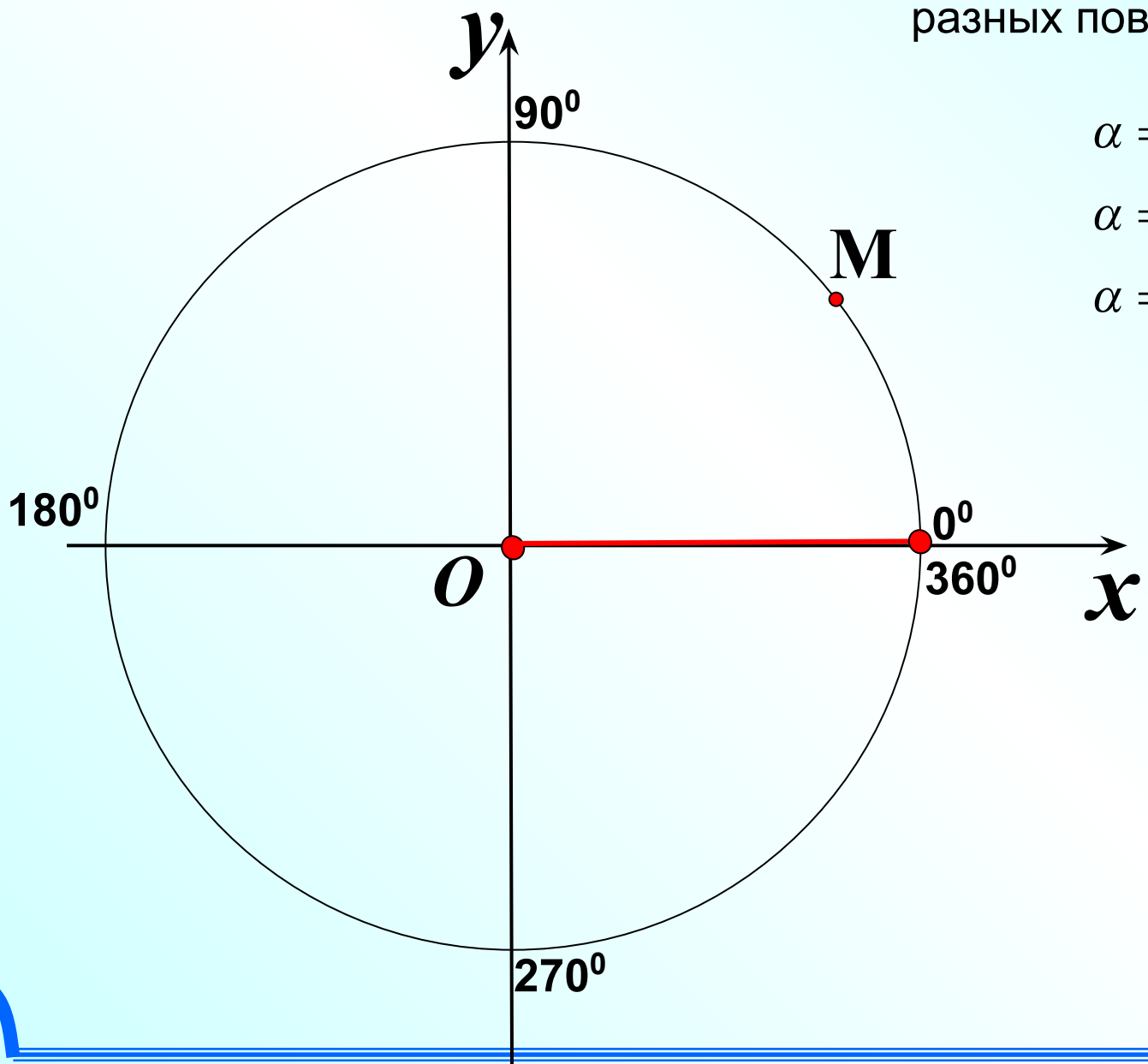


$$\alpha = -323^0$$

Отрицательное направление поворота: по часовой стрелке.

Поворот

В т. М можем попасть, выполнив множество разных поворотов.

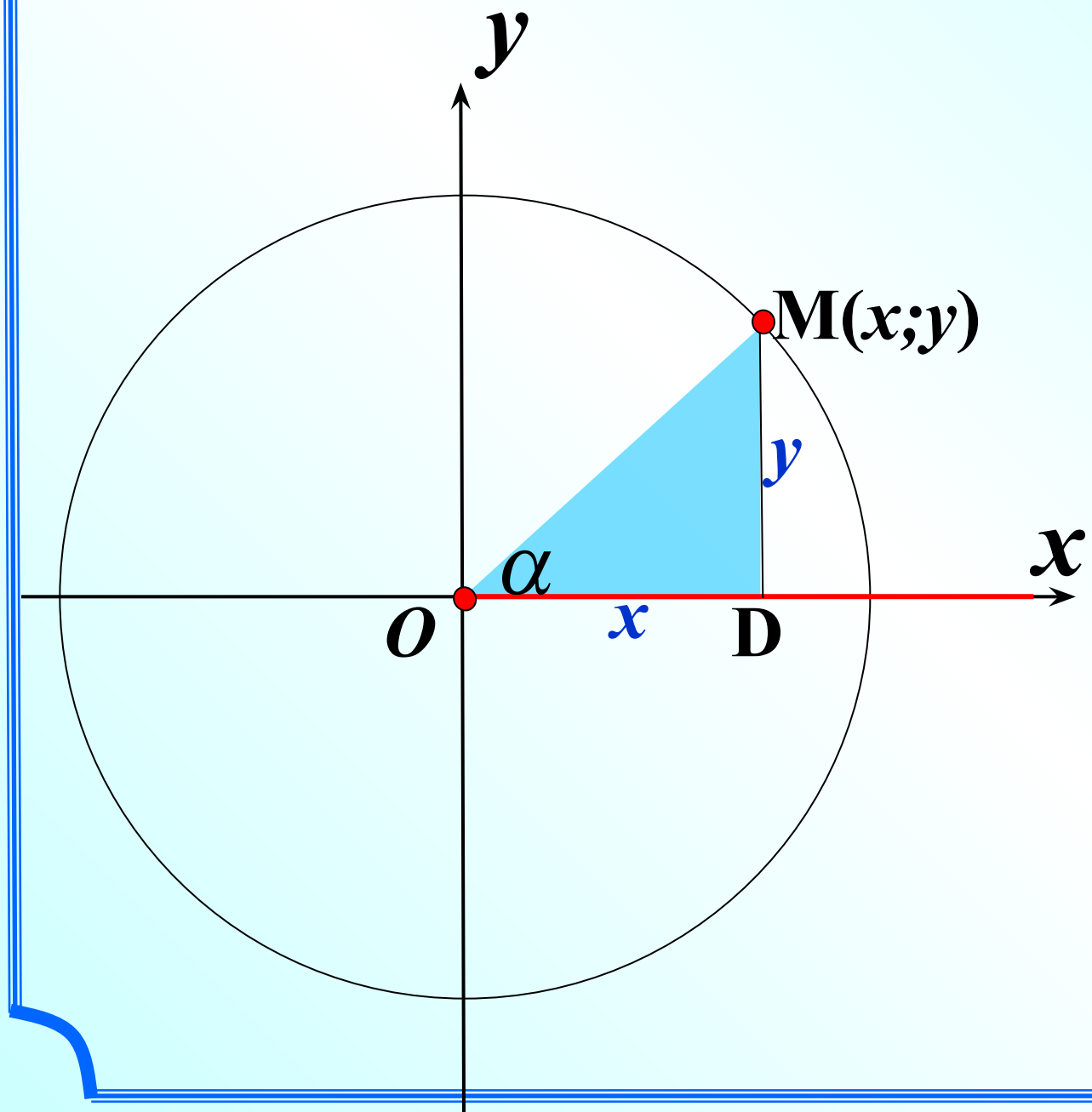


$$\alpha = 37^0$$

$$\alpha = -323^0$$

$$\alpha = 397^0$$

Единичная окружность $r = 1$



$$\sin\alpha = \frac{MD}{OM}$$

$$\sin\alpha = \frac{y}{1}$$

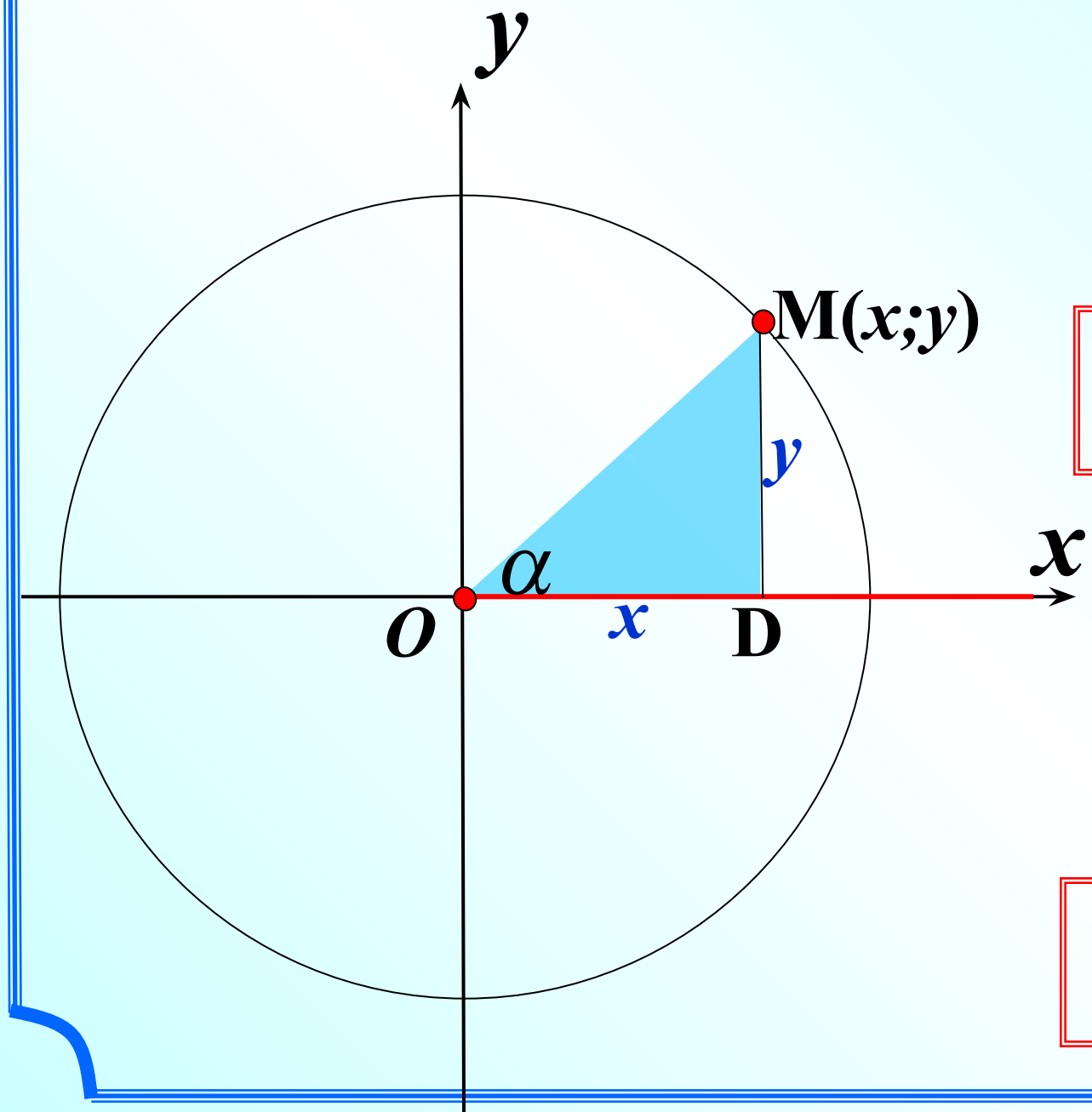
$$\boxed{\sin\alpha = y}$$ *

$$\cos\alpha = \frac{OD}{OM}$$

$$\cos\alpha = \frac{x}{1}$$

$$\boxed{\cos\alpha = x}$$ *

Единичная окружность $r = 1$



$$tg\alpha = \frac{MD}{OD}$$

$$tg = \frac{y}{x}$$

$$\boxed{\mathrm{tg}\alpha = \frac{\sin\alpha}{\cos\alpha}}$$ *

$$ctg\alpha = \frac{OD}{DM}$$

$$ctg\alpha = \frac{x}{y}$$

$$\boxed{ctg\alpha = \frac{\cos\alpha}{\sin\alpha}}$$ *

Синусом угла α называется ордината y точки М, а косинусом угла α – абсцисса x точки М.

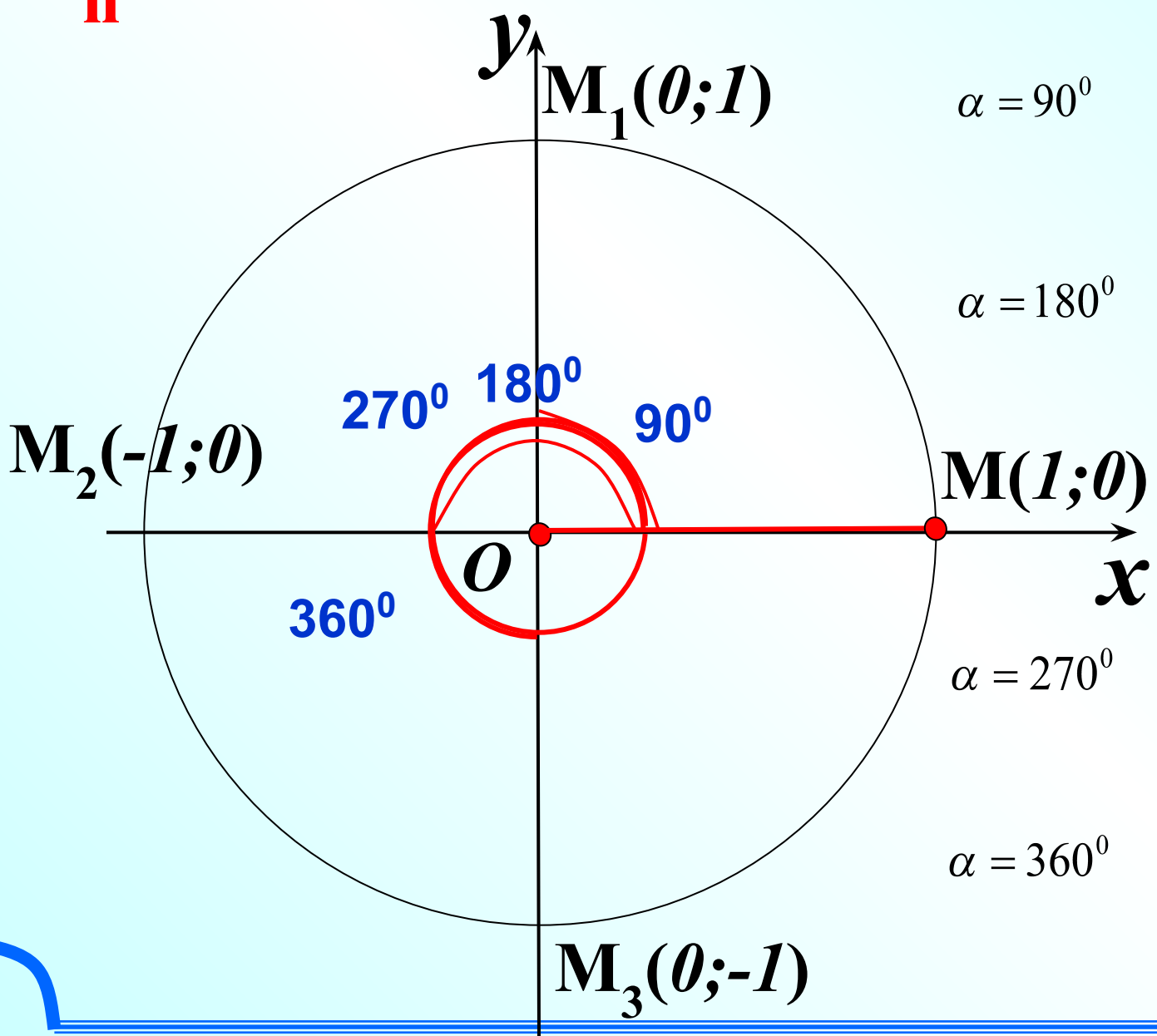
$$\sin a = y; \quad \cos a = x$$

$$\mathrm{tg}\alpha = \frac{\sin\alpha}{\cos\alpha} \qquad ctg\alpha = \frac{\cos\alpha}{\sin\alpha}$$

$$\mathrm{tg}\alpha \cdot ctg\alpha = \frac{\sin\alpha}{\cos\alpha} \cdot \frac{\cos\alpha}{\sin\alpha} = 1$$

si $a = y$ $\cos a = x$

n



$\alpha = 0^0$ $\sin 0^0 = 0,$ $\cos 0^0 = 1,$

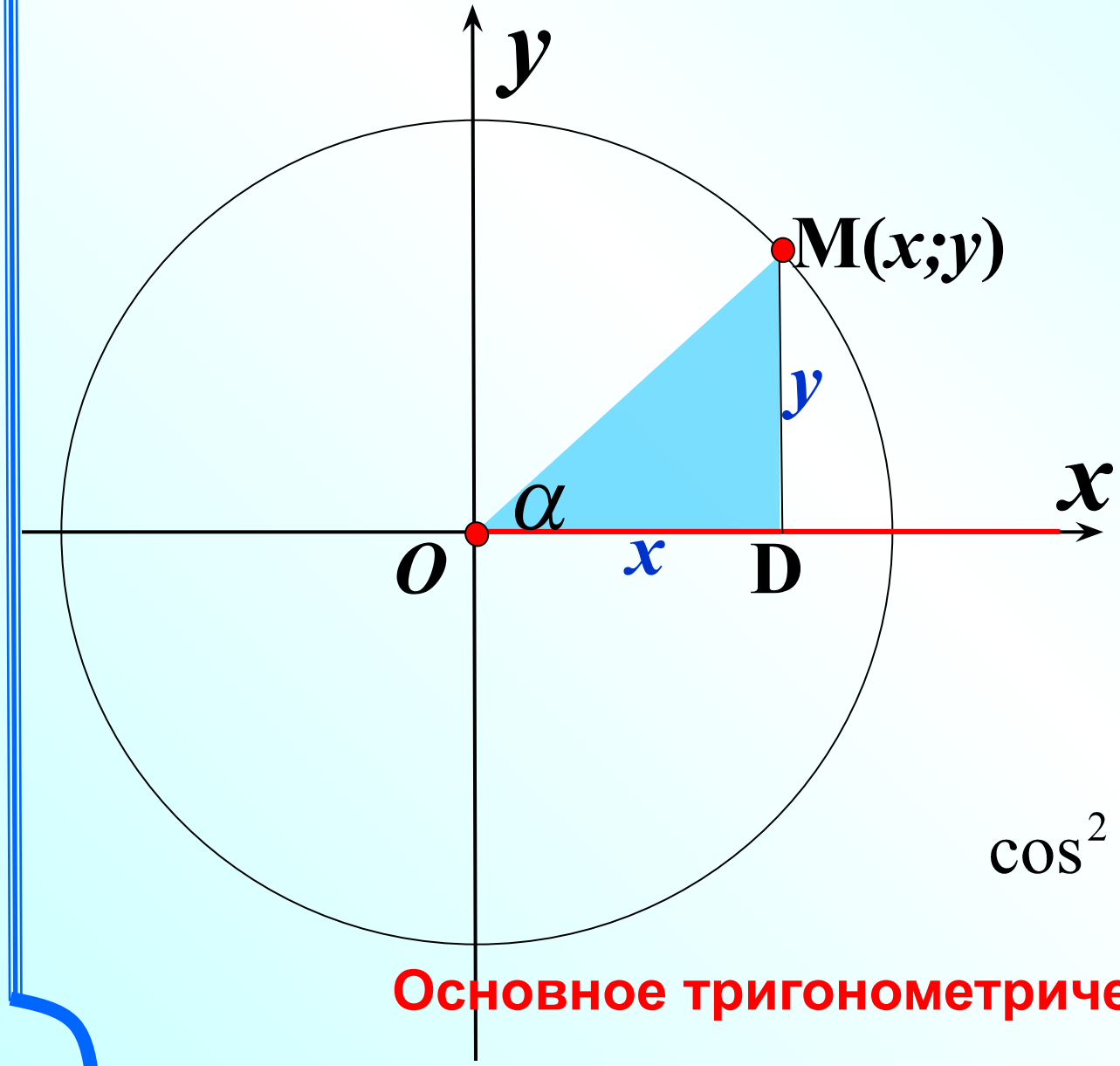
$\alpha = 90^0$ $\sin 90^0 = 1,$ $\cos 90^0 = 0,$

$\alpha = 180^0$ $\sin 180^0 = 0,$ $\cos 180^0 = -1.$

$\alpha = 270^0$ $\sin 270^0 = -1,$ $\cos 270^0 = 0.$

$\alpha = 360^0$ $\sin 360^0 = 0,$ $\cos 360^0 = 1.$

Единичная окружность $r = 1$



$$x^2 + y^2 = 1$$

$$\sin\alpha = y$$

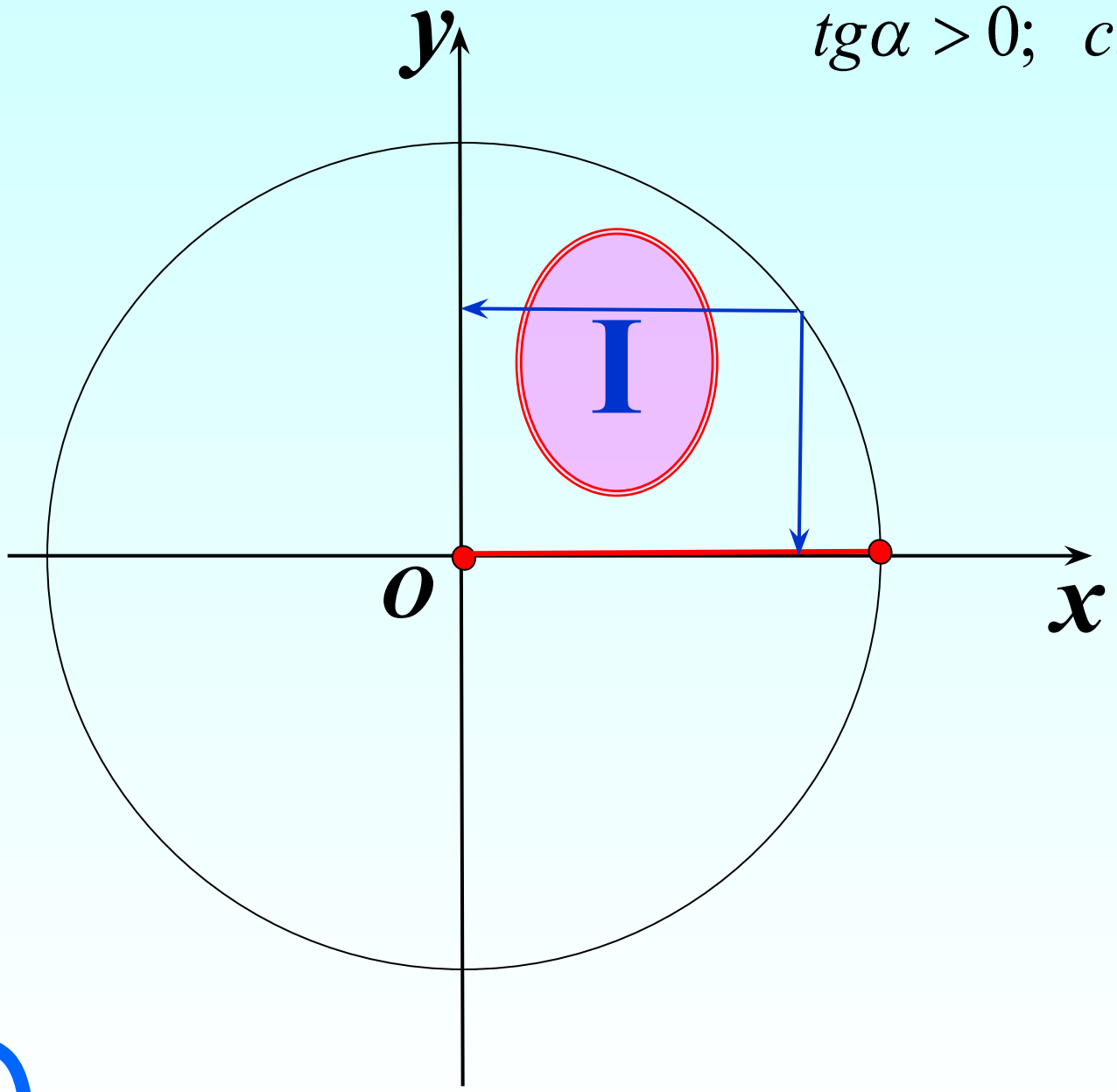
$$\cos\alpha = x$$

$$\cos^2\alpha + \sin^2 a = 1$$

Основное тригонометрическое тождество

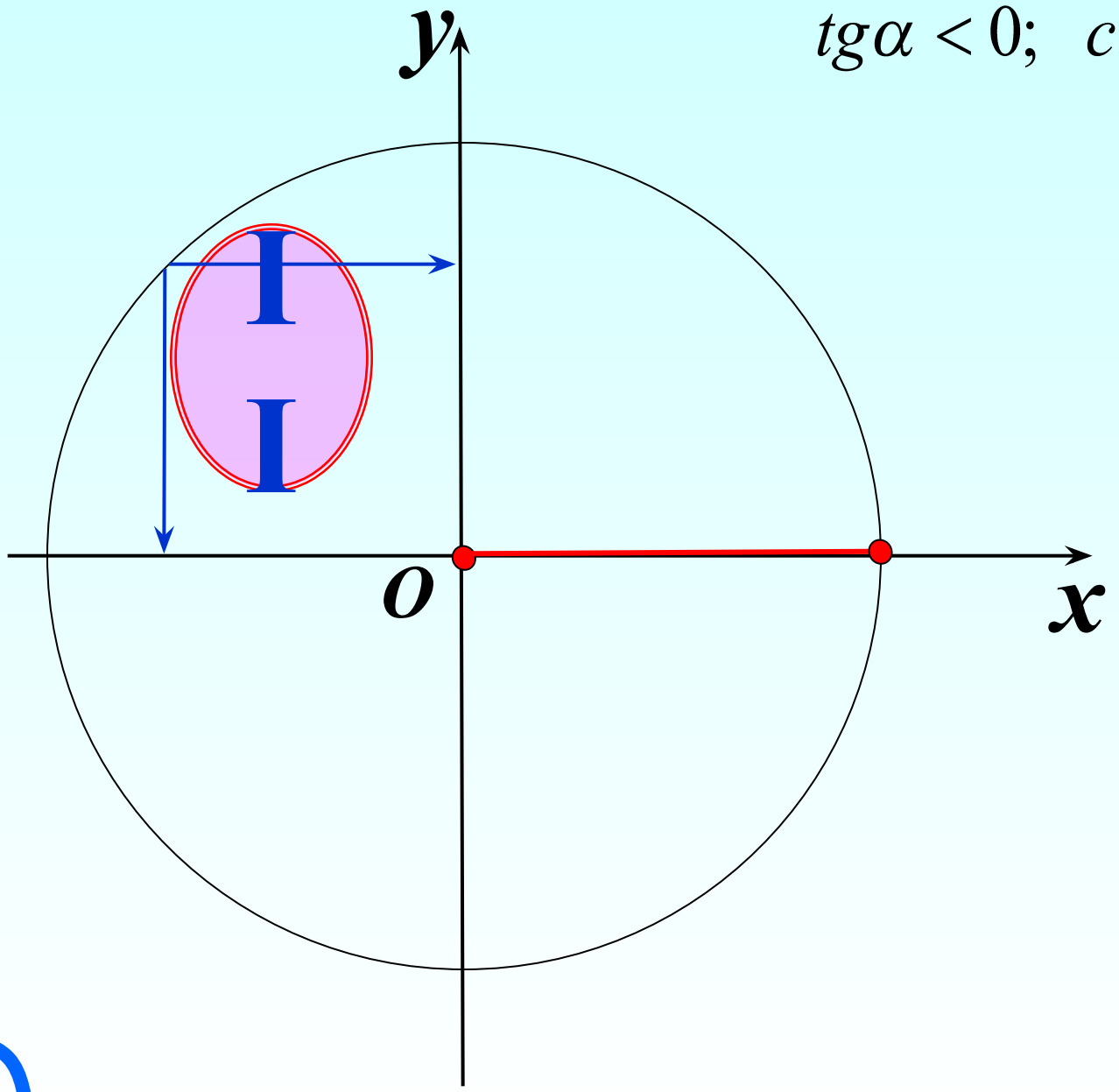
Если угол α **острый, то** $\sin\alpha > 0$ **и** $\cos\alpha > 0$

$tg\alpha > 0; \quad ctg\alpha > 0$



Если угол α **тупой, то** $\sin\alpha > 0$ **и** $\cos\alpha < 0$

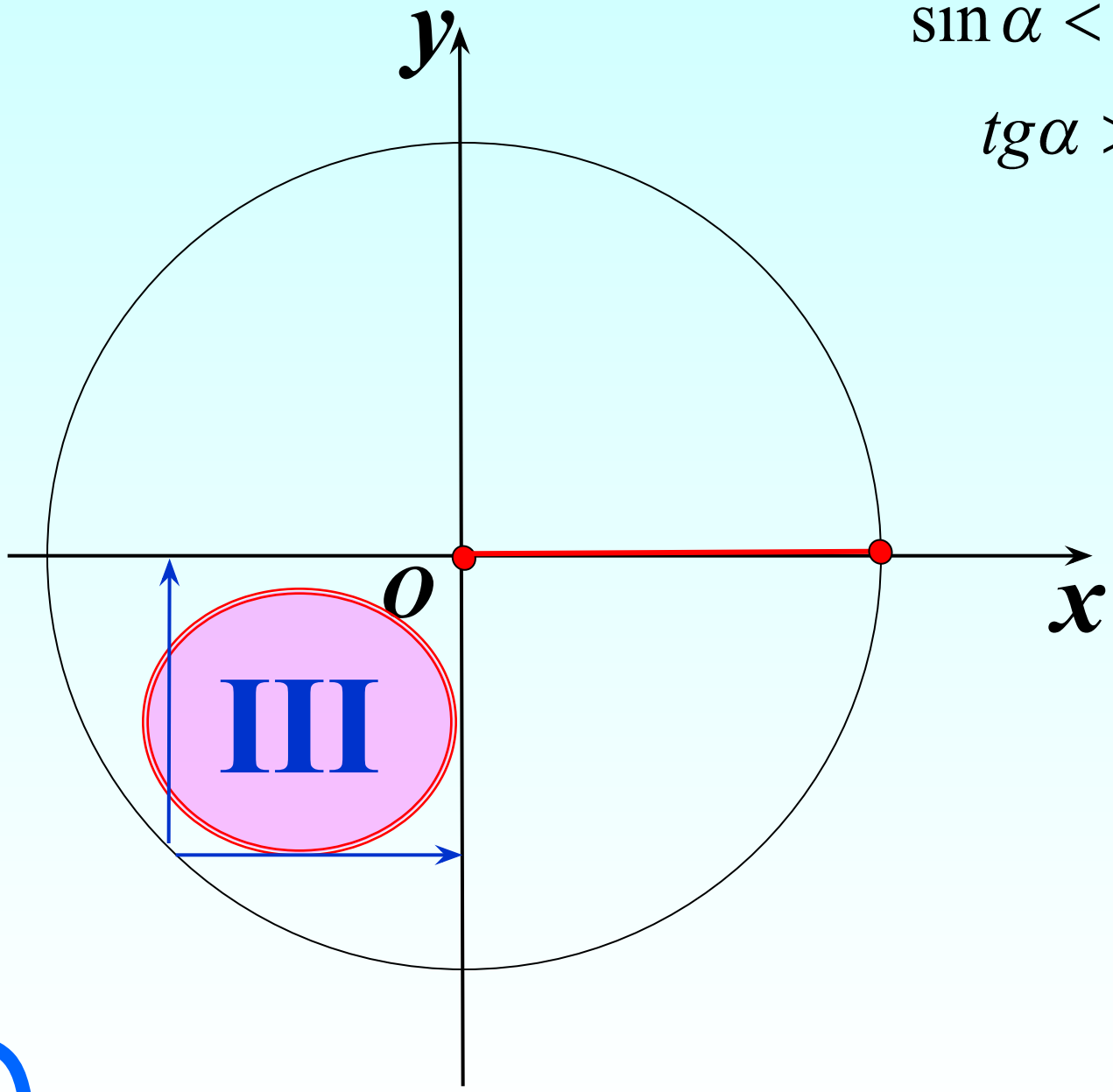
$tg\alpha < 0; \quad ctg\alpha < 0$



Если угол $180^0 < \alpha < 270^0$, **то**

$\sin\alpha < 0$ **и** $\cos\alpha < 0$

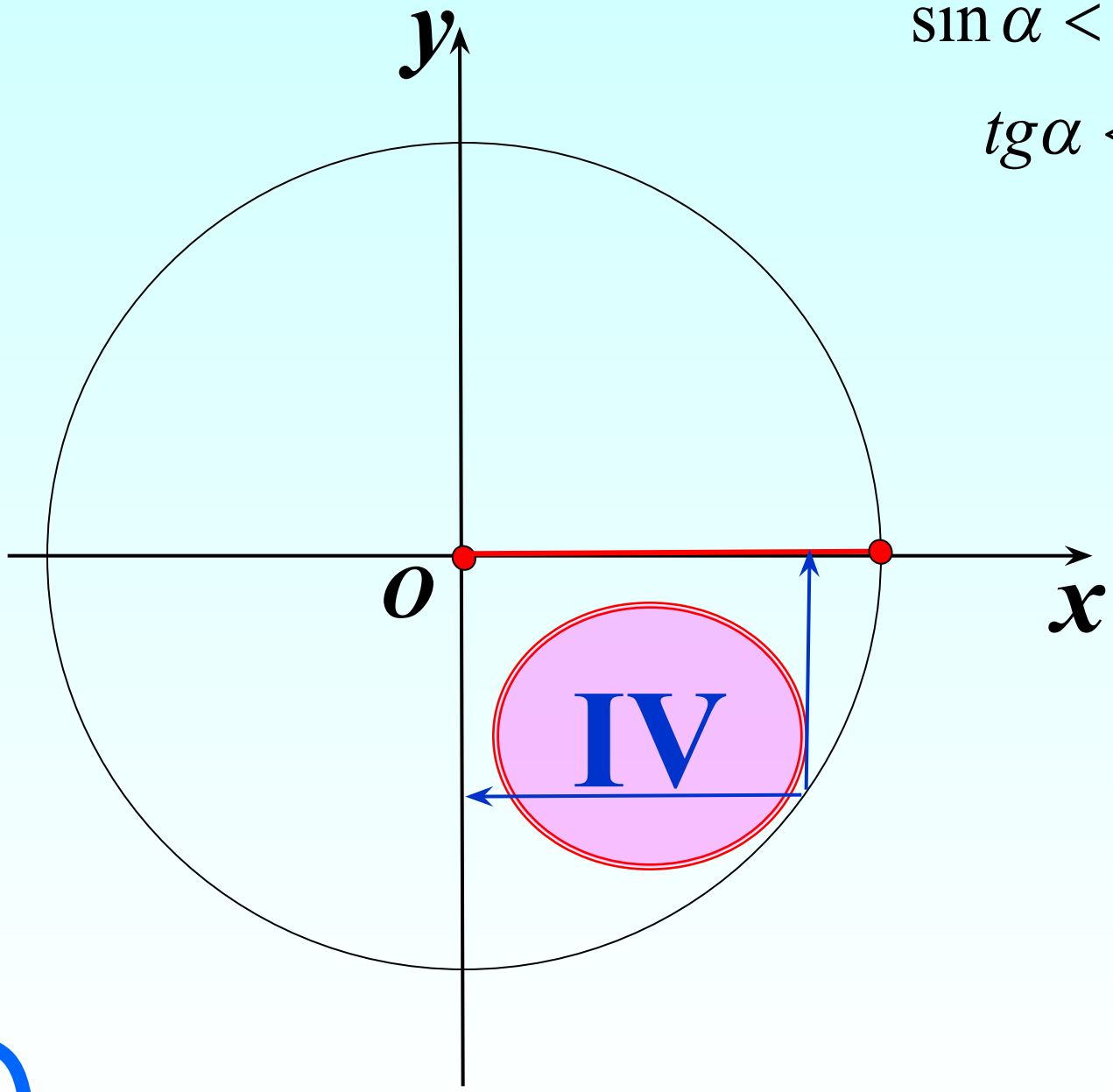
$tg\alpha > 0; \quad ctg\alpha > 0$



Если угол $270^0 < \alpha < 360^0$, **то**

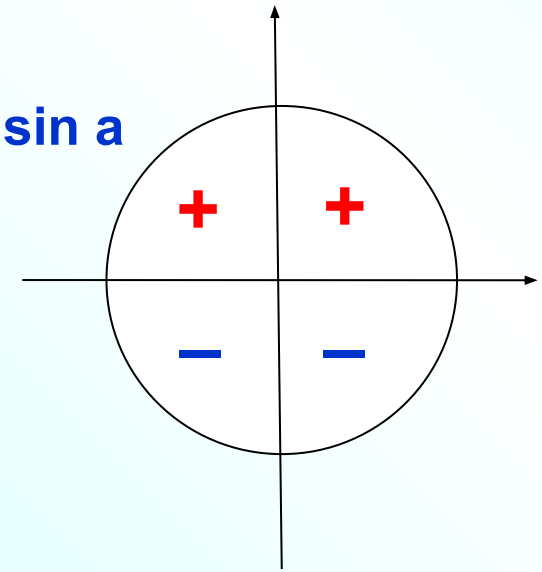
$\sin\alpha < 0$ **и** $\cos\alpha > 0$

$tg\alpha < 0; \quad ctg\alpha < 0$

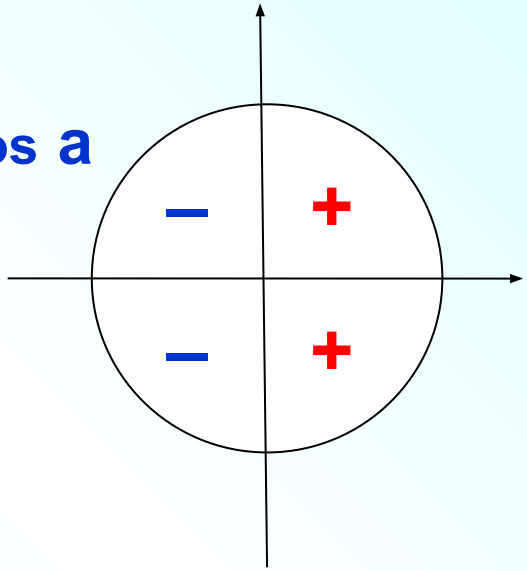


ЗНАКИ тригонометрических функций

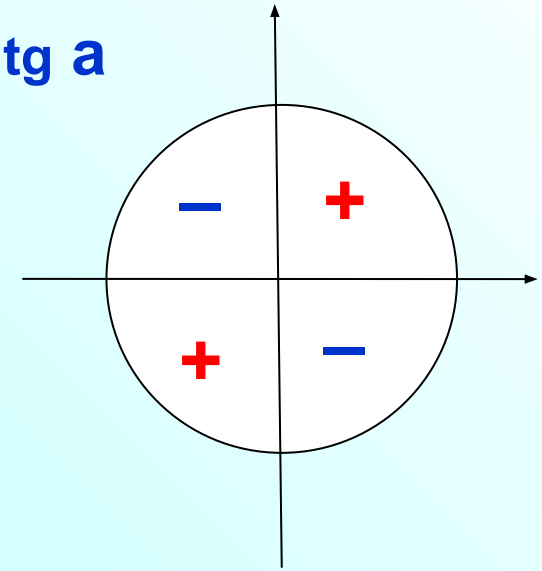
sin a



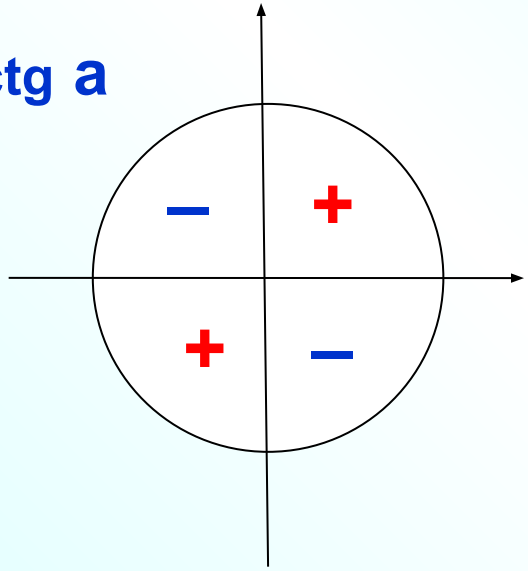
cos a

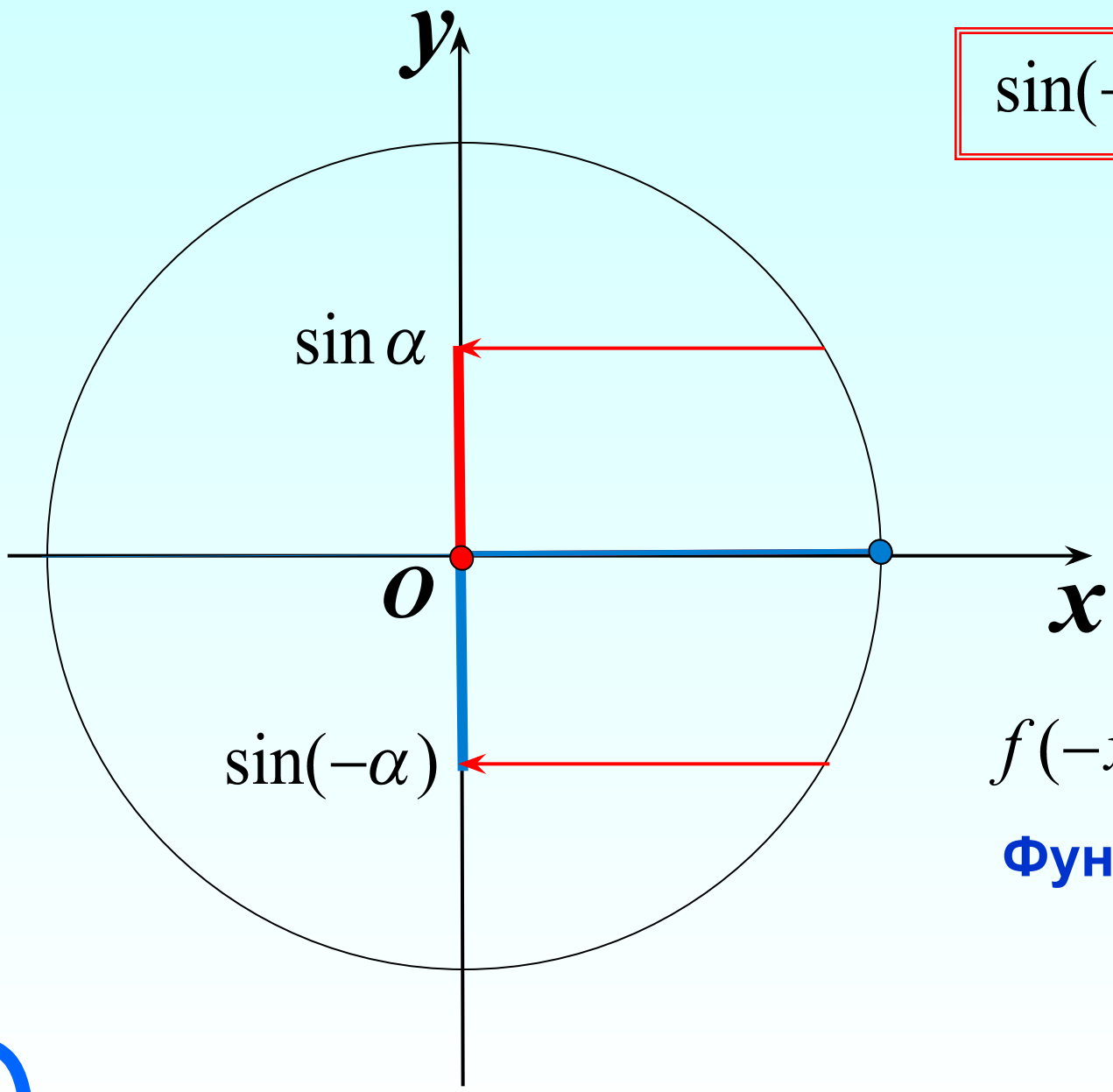


tg a



ctg a

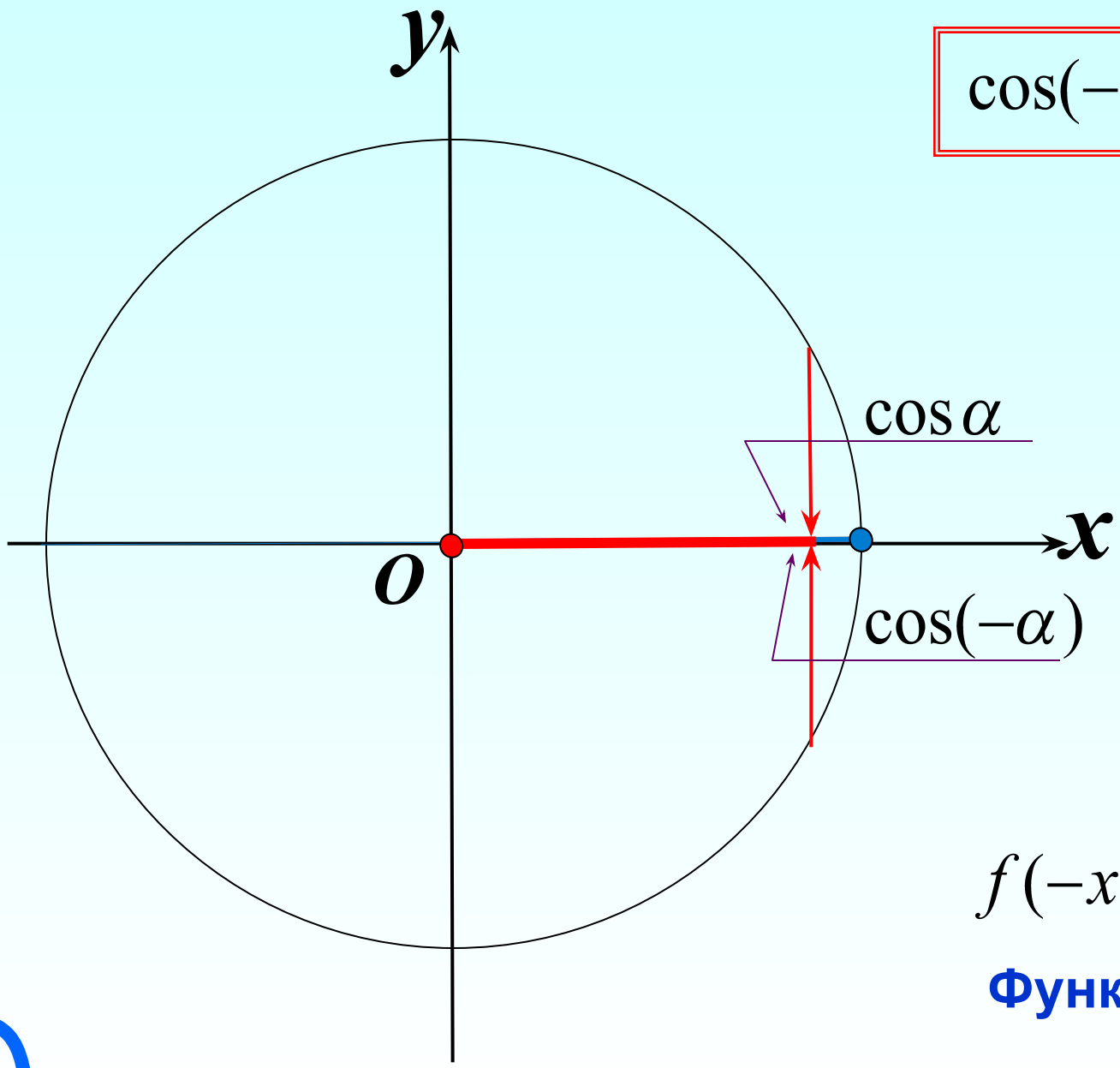




$$\sin(-\alpha) = -\sin\alpha$$

$$f(-x) = -f(x)$$

Функция нечетная



$$\cos(-\alpha) = \cos\alpha$$

$$f(-x) = f(x)$$

Функция четная

$$\mathrm{tg}\,\alpha = \frac{\sin\alpha}{\cos\alpha}$$

$$\mathrm{tg}(-\alpha) = \frac{\sin(-\alpha)}{\cos(-\alpha)} = \frac{-\sin\alpha}{\cos\alpha} = -\frac{\sin\alpha}{\cos\alpha} = -tg\alpha$$

$$f(-x) = -f(x)$$

Функция нечетная

$$\boxed{\mathrm{tg}(-\alpha) = -tg\alpha}$$

Докажи самостоятельно

$$\boxed{\mathrm{ctg}(-\alpha) = -ctg\alpha}$$

$$f(-x) = f(x)$$

Функция четная

$$f(-x) = -f(x)$$

Функция нечетная

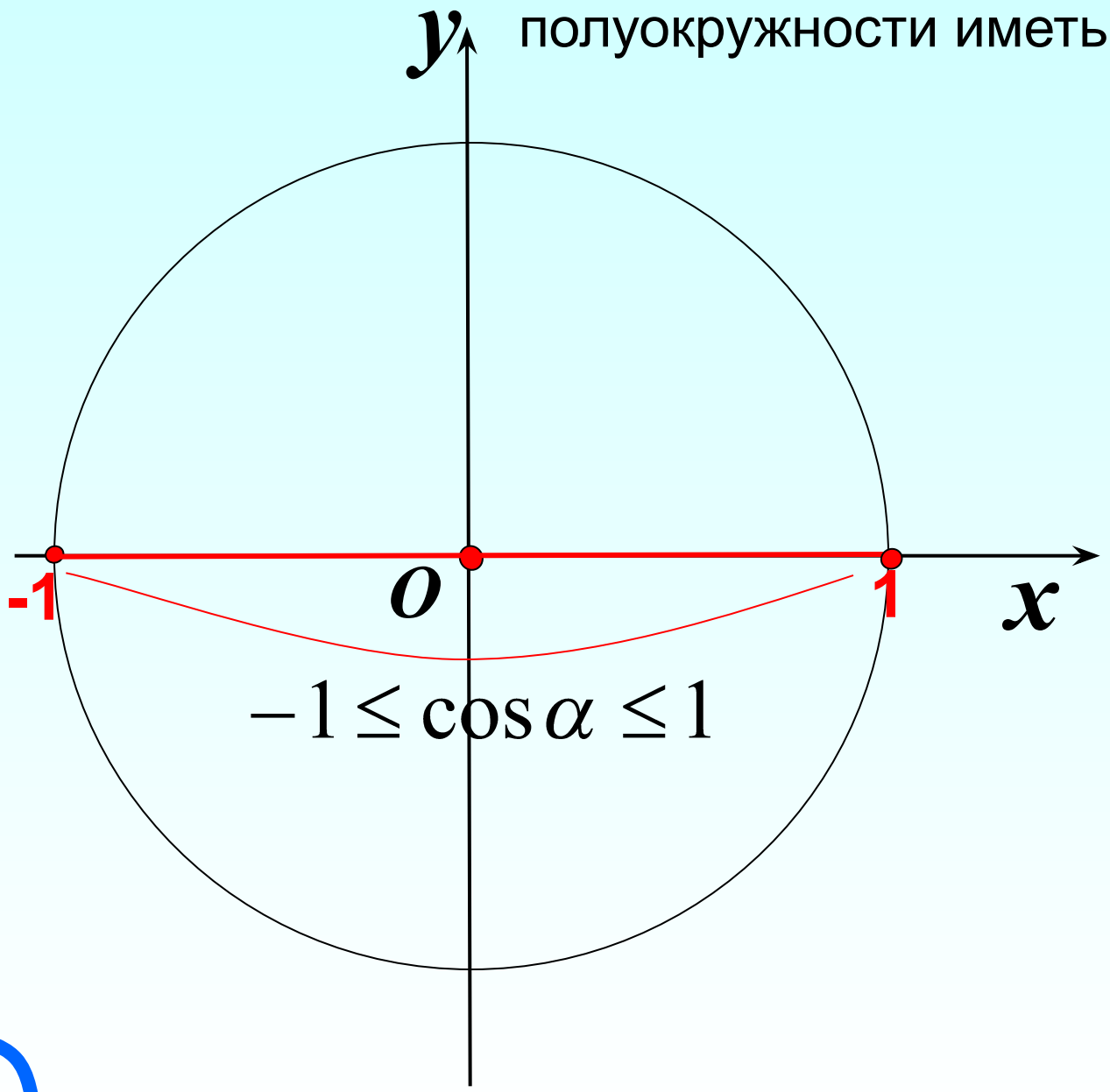
$$\cos(-\alpha) = \cos\alpha$$

$$\sin(-\alpha) = -\sin\alpha$$

$$\mathrm{tg}(-\alpha) = -tg\alpha$$

$$\mathrm{ctg}(-\alpha) = -ctg\alpha$$

Может ли абсцисса точки единичной полуокружности иметь значения



$$-1 \le \cos\alpha \le 1$$

$$0{,}3 \in [-1;1]$$

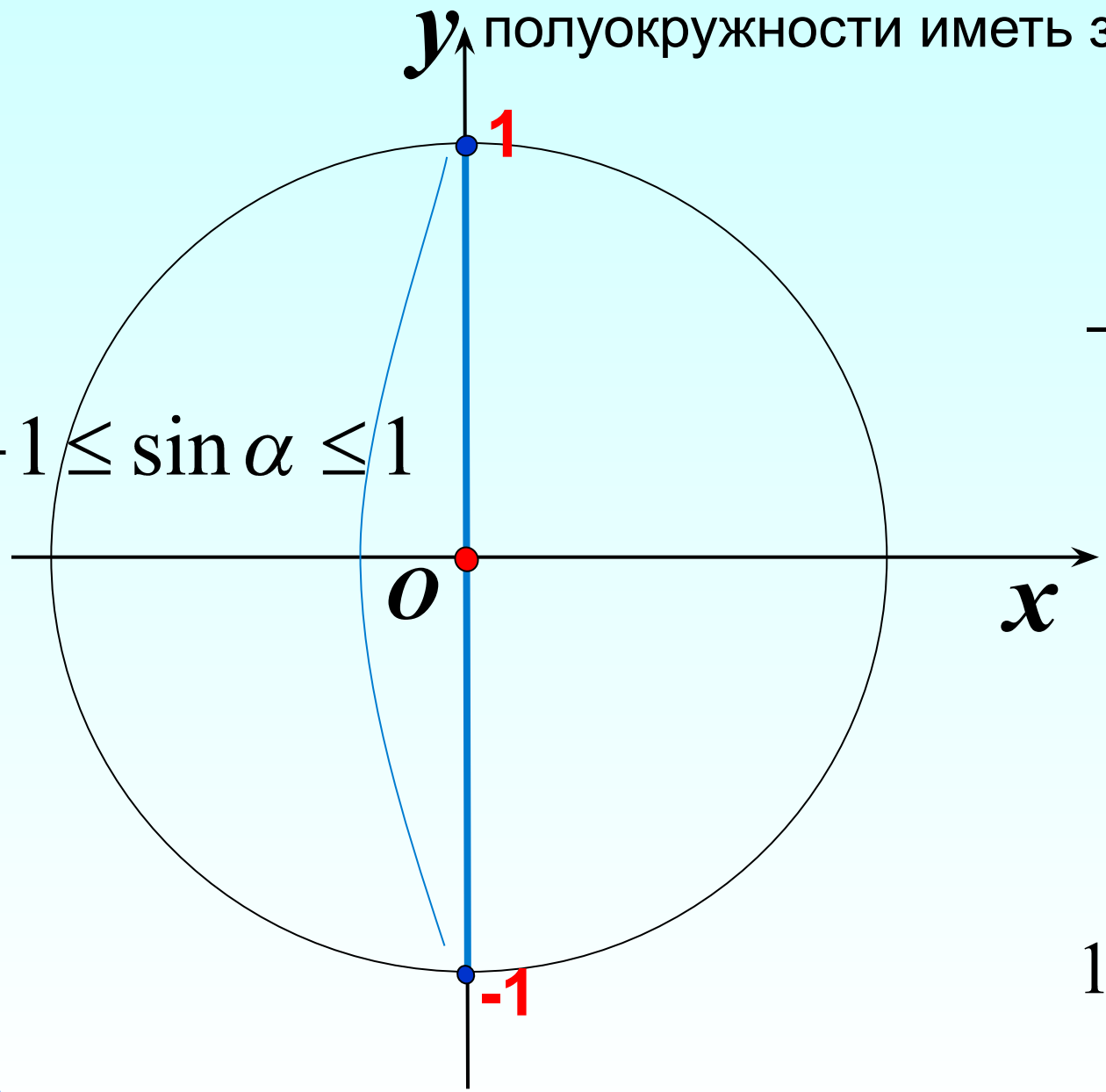
$$-2{,}8 \notin [-1;1]$$

$$\frac{1}{3} \in [-1;1]$$

$$-\frac{1}{3} \in [-1;1]$$

$$1\frac{2}{3} \notin [-1;1]$$

Может ли ордината точки единичной полуокружности иметь значения



$$-1 \le \sin\alpha \le 1$$

$0{,}6 \in [-1;1]$

$-0{,}3 \notin [-1;1]$

$7 \notin [-1;1]$

$\frac{1}{7} \in [-1;1]$

$1{,}002 \notin [-1;1]$