1.3. Trigonometric Functions

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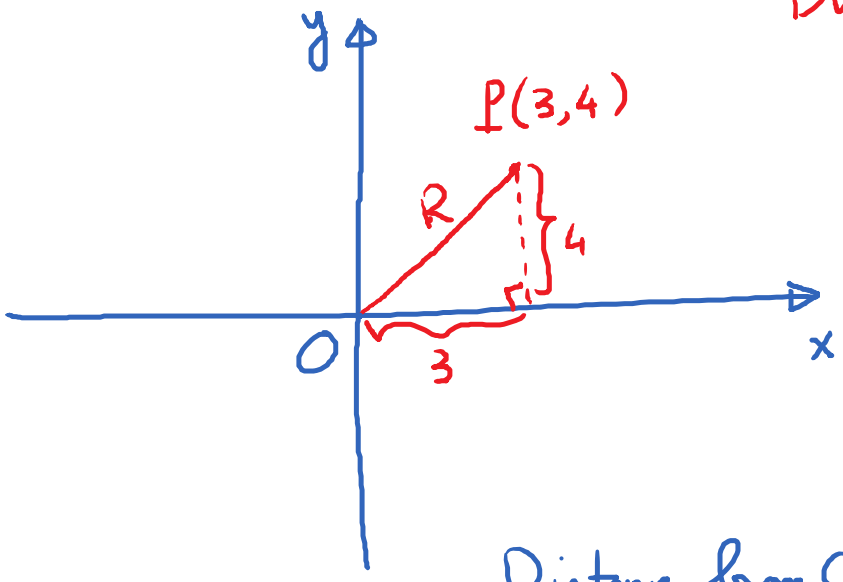
Objective: Define 6 basic trig functions

Distance from O to P.

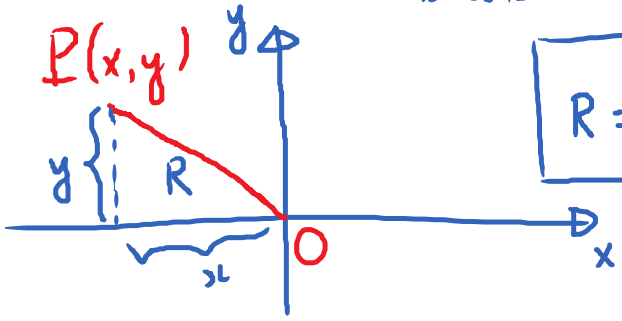


$$R^2 = 3^2 + 4^2$$

$$R = \sqrt{3^2 + 4^2}$$

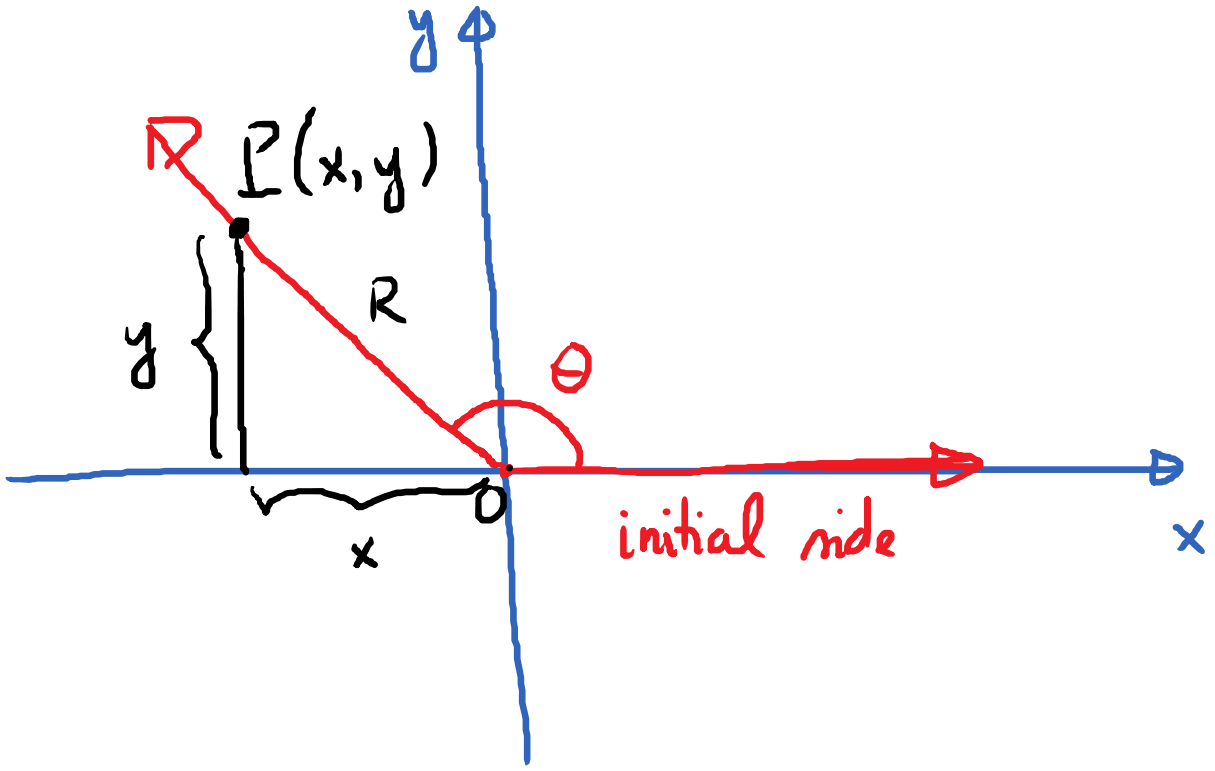
$$R = \sqrt{25} = 5$$

Distance from O to P(x, y) is:



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

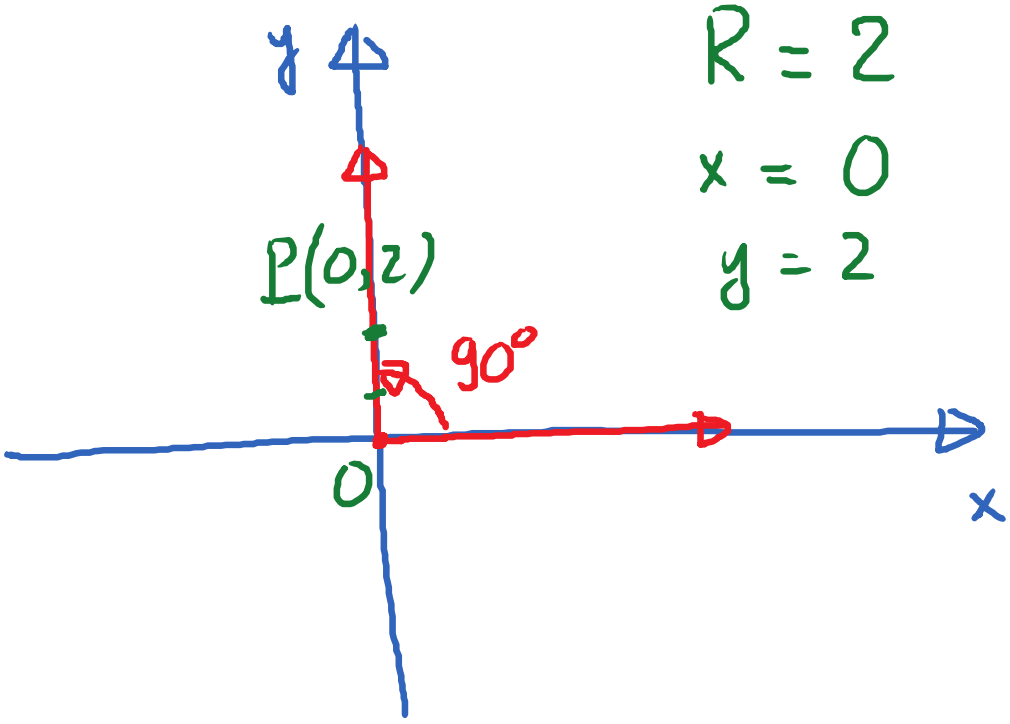
θ : any angle $\longrightarrow$ in standard position.



Names of 6 basic trig functions

$$\sin\theta = \frac{y}{R} \quad ; \quad \csc\theta = \frac{R}{y} \quad (y \neq 0) \qquad \tan\theta = \frac{y}{x} \quad (x \neq 0)$$

$$\cos\theta = \frac{x}{R} \quad ; \quad \sec\theta = \frac{R}{x} \quad (x \neq 0) \qquad \cot\theta = \frac{x}{y} \quad (y \neq 0)$$



$R = 2$

$x = 0$

$y = 2$

undefined

$\sin(90°) = 1$; $\csc(90°) = 1$; $\tan(90°) = \frac{2}{0}$

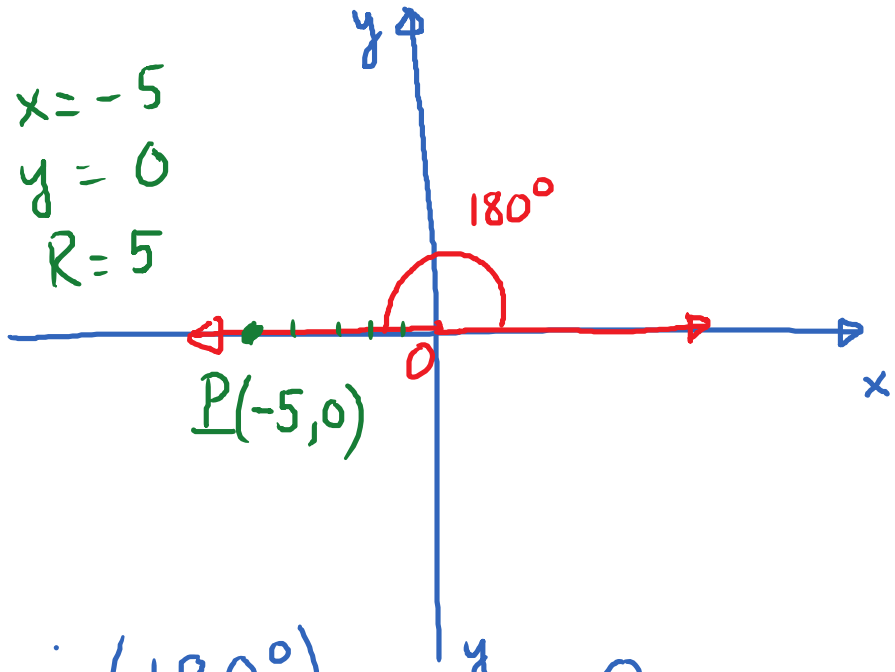
$\cos(90°) = 0$ $\sec(90°) = \frac{2}{0}$; $\cot(90°) = \frac{0}{2}$

$= 0$

undefined

$\sin(90°) = 1$; $\csc(90°) = 1$; $\tan(90°) =$ undef

$\cos(90°) = 0$; $\sec(90°)$ undef; $\cot(90°) = 0$



$$\sin(180^\circ) = \frac{y}{R} = 0$$

$$\cos(180^\circ) = \frac{x}{R} = -1$$

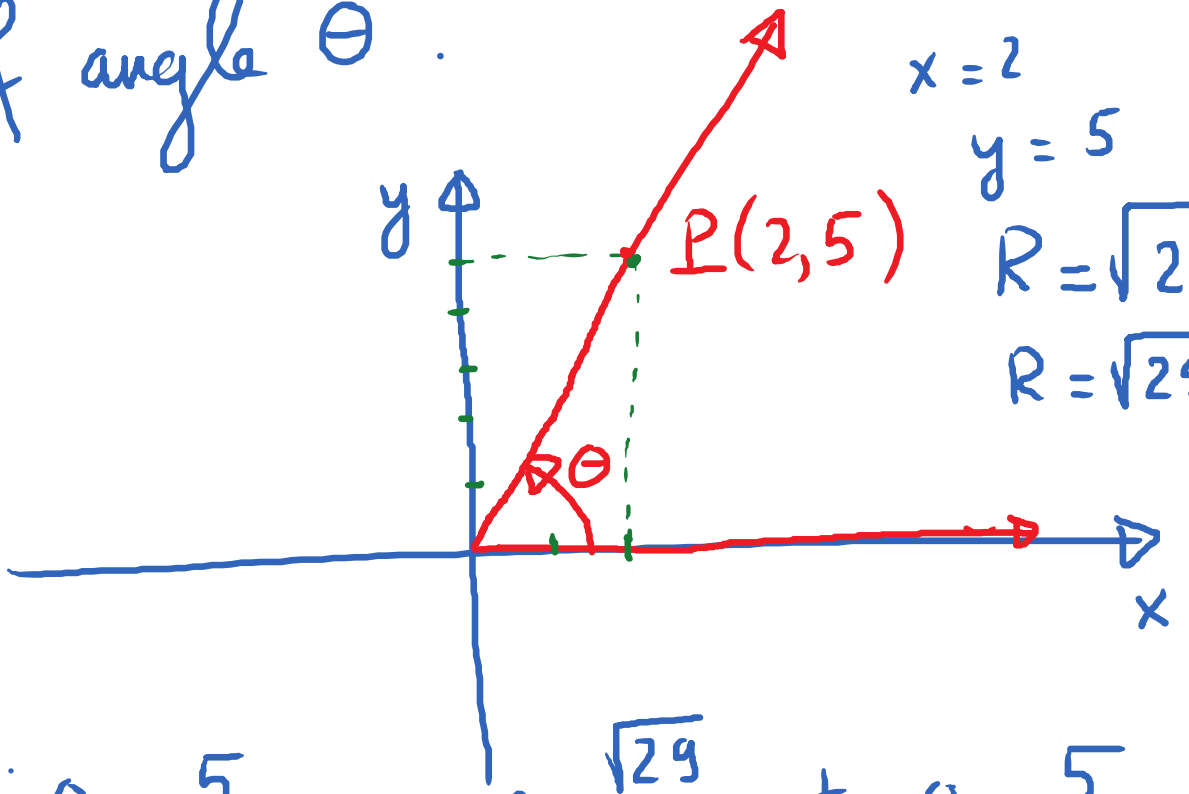
$$\sec(180^\circ) = \frac{R}{x} = -1$$

$$\csc(180^\circ) = \frac{R}{y} = \frac{5}{0} = \text{undefined}$$

$$\tan(180^\circ) = \frac{y}{x} = \frac{0}{-5} = 0$$

$$\cot(180^\circ) = \frac{x}{y} = \frac{-5}{0} = \text{undefined}$$

E.g. The terminal side of an angle θ in standard position passes through the point $(2, 5)$. Find the values of the 6 trig functions of angle θ.



$x = 2$

$y = 5$

$R = \sqrt{2^2 + 5^2}$

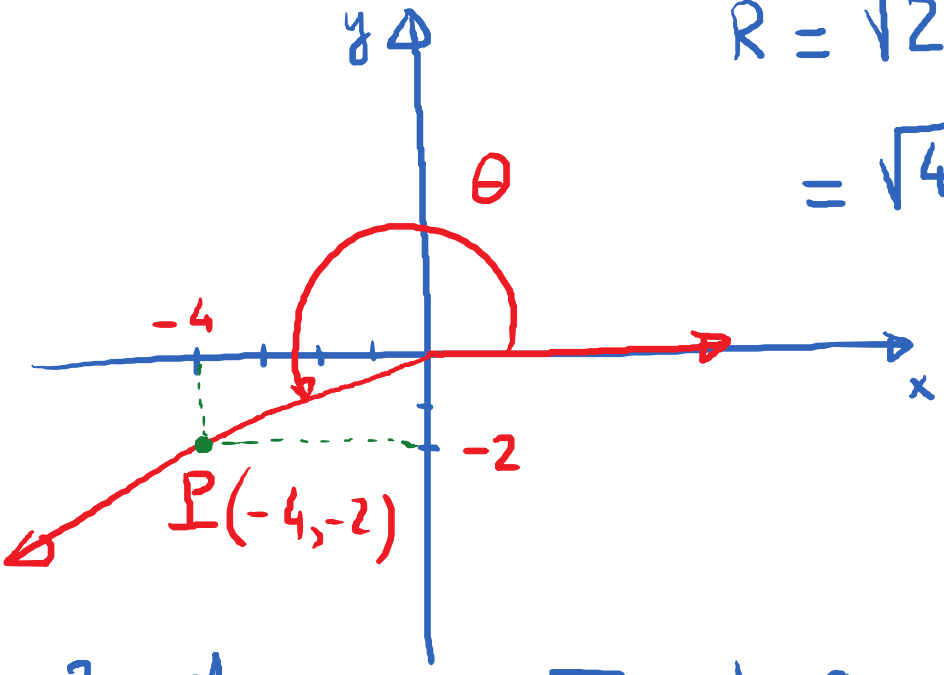
$R = \sqrt{29}$

$\sin\theta = \frac{5}{\sqrt{29}}$ $\quad \sec\theta = \frac{\sqrt{29}}{2}$ $\quad \tan\theta = \frac{5}{2}$

$\cos\theta = \frac{2}{\sqrt{29}}$ $\quad \csc\theta = \frac{\sqrt{29}}{5}$ $\quad \cot\theta = \frac{2}{5}$.

E.g. The terminal side of an angle θ in standard position passes through the point $(-4,-2)$.

Q: Find all the basic trig functions of θ?



$R = \sqrt{20}$

$= \sqrt{4 \cdot 5} = 2\sqrt{5}$

$\sin\theta = \frac{-2}{2\sqrt{5}} = \frac{-1}{\sqrt{5}}$ $\csc\theta = -\sqrt{5}$; $\tan\theta = \frac{1}{2}$

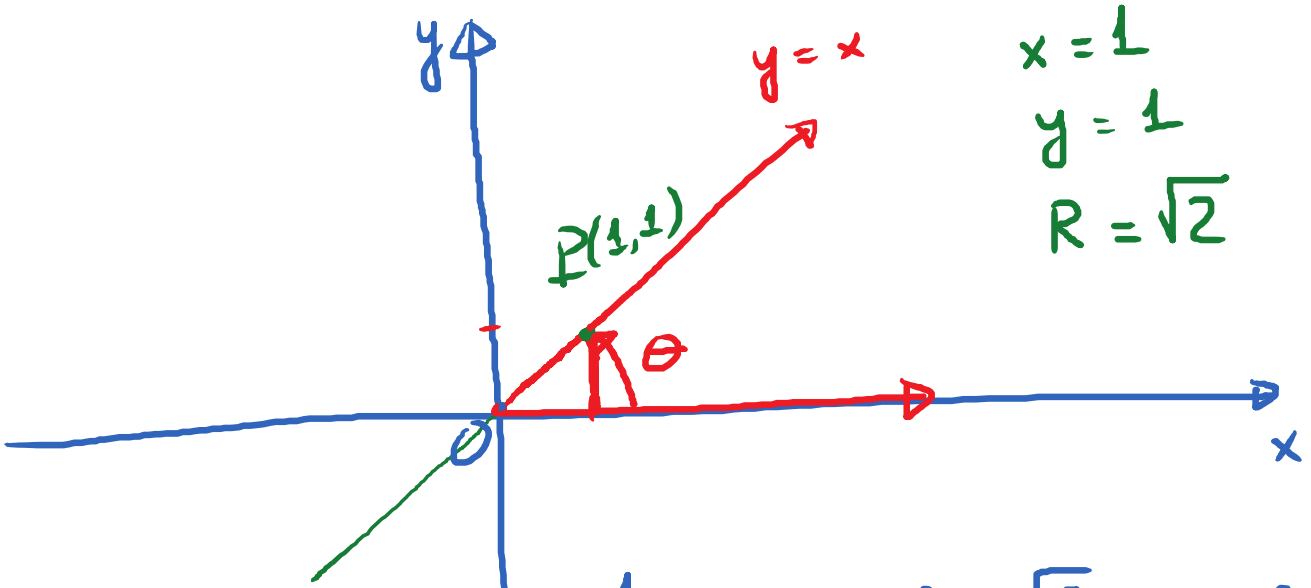
$\cos\theta = \frac{-4}{2\sqrt{5}} = \frac{-2}{\sqrt{5}}$ $\sec\theta = \frac{-\sqrt{5}}{2}$; $\cot\theta = 2$

E.g. Slope-intercept equation for a straight line is $y = mx + b$.

$y = x$.

E.g.

Find the six trig functions of the angle θ in standard position whose terminal side is the ray $y = x$; $x \geq 0$.



$\sin\theta = \frac{1}{\sqrt{2}}$; $\cos\theta = \frac{1}{\sqrt{2}}$; $\sec\theta = \sqrt{2}$; $\csc\theta = \sqrt{2}$

$\tan\theta = 1$; $\cot\theta = 1$

$\sqrt{2}$ $\quad$ $\sqrt{2}$

$\tan\theta = 1$; $\cot\theta = 1$

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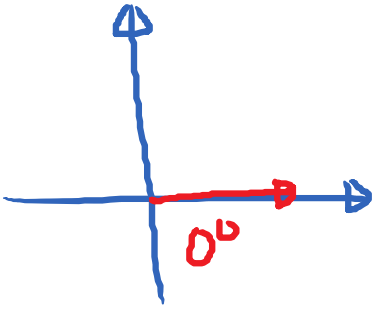
θ	$\sin\theta$	$\cos\theta$	$\tan\theta$	$\cot\theta$	$\sec\theta$	$\csc\theta$
90°						
180°						
270°						
360°						
0°						



Fill in the table