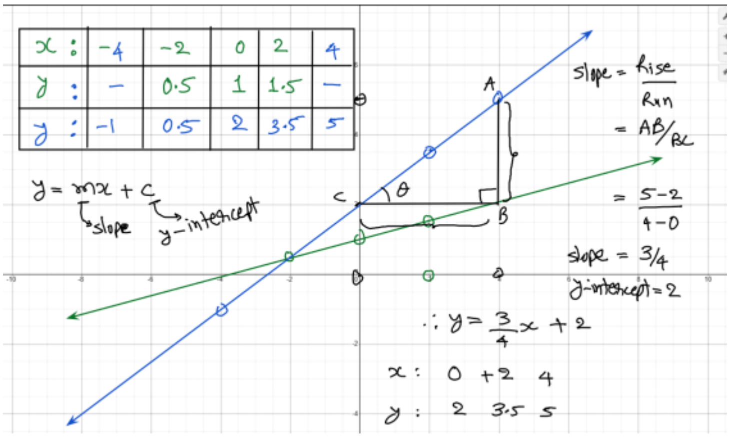
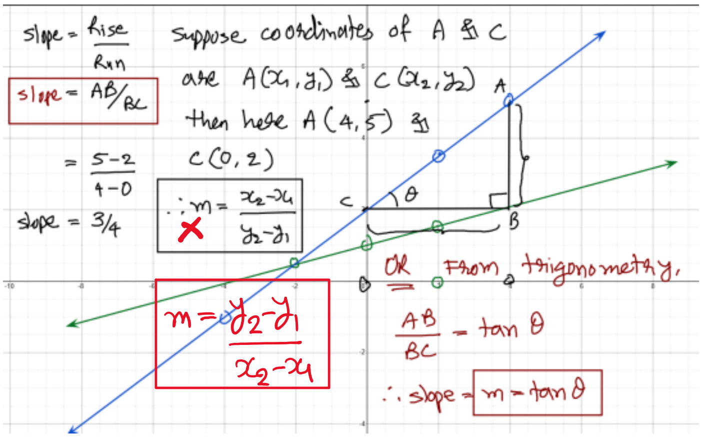
⭐ Equations of a straight line -

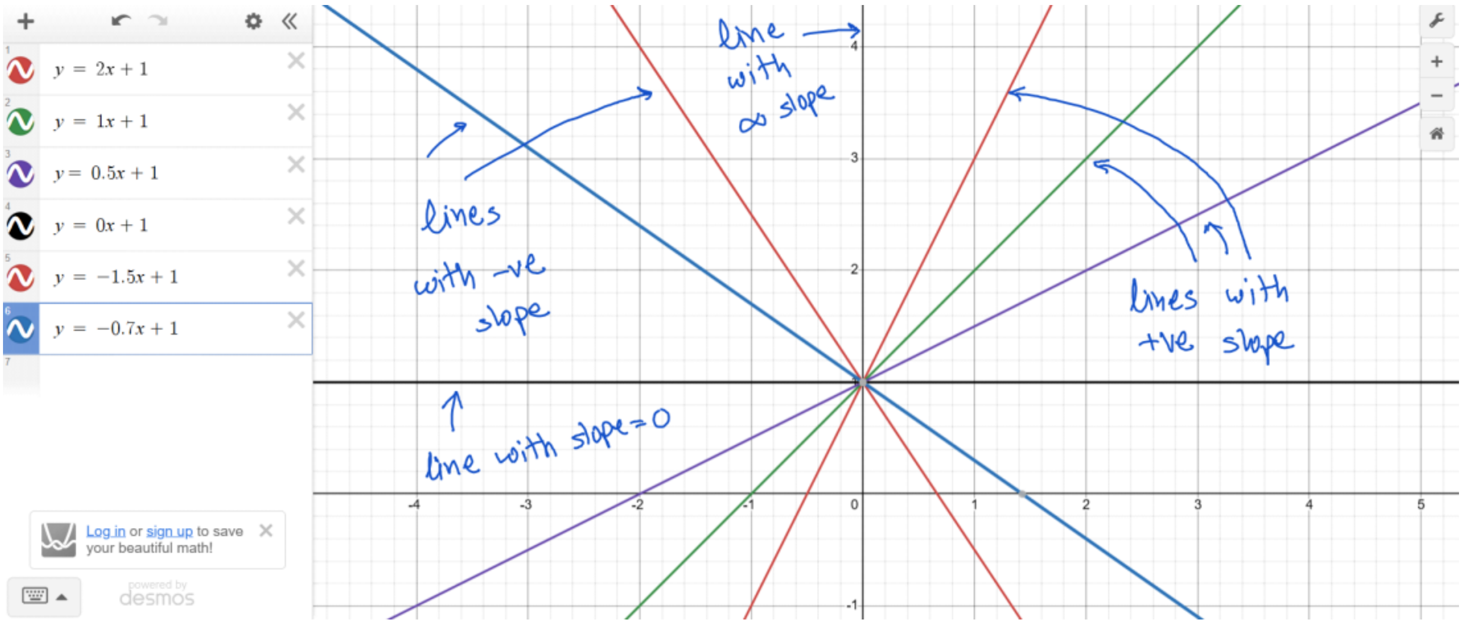
① Slope - Intercept form : $y = mx + c$

m → slope, c → y-intercept



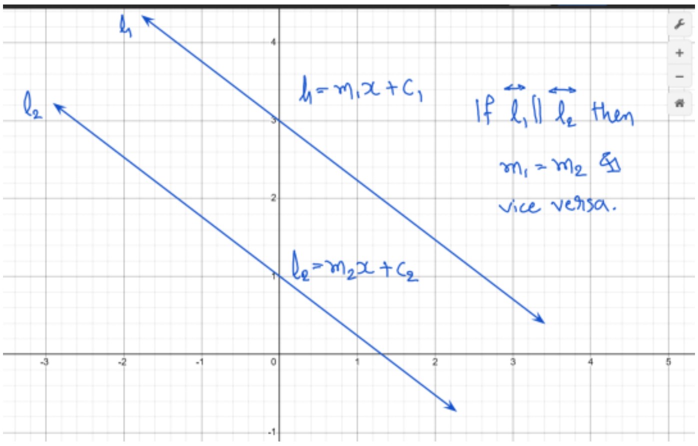


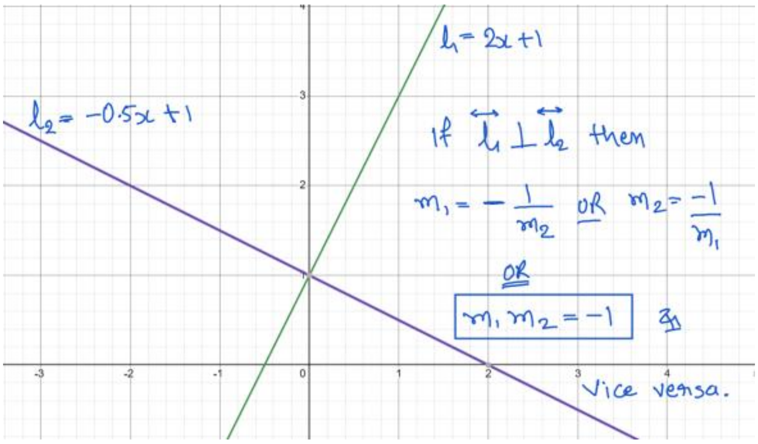
More about slope :



Slopes of parallel lines are equal

slopes of perpendicular lines :





So if we know the slope of a line and its y-intercept then we can use $y = mx + c$ form to get equation of the line but what if we don't know 'C' but we know the coordinates of a point which is on the line?

② Slope-Point Form :

As we know $m = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow y_2 - y_1 = m(x_2 - x_1)$

To generalize this, let's replace y_2 by y & x_2 by x :

$$\boxed{y - y_1 = m(x - x_1)}$$

③ Two-Points Form :

Replacing $m = \frac{y_2 - y_1}{x_2 - x_1}$ in the above equation

$$\boxed{(y - y_1) = \frac{(y_2 - y_1)(x - x_1)}{(x_2 - x_1)}}$$

We can use this form to get equation of the line if we know coordinates of two points $A(x_1, y_1)$

we can use this form

if we know coordinates of two points $A(x_1, y_1)$ & $B(x_2, y_2)$ which are on the line

④ Intercept Form : $\boxed{\dfrac{x}{a} + \dfrac{y}{b} = 1}$

where a is x-intercept & b is y-intercept.

⑤ General Form : $\boxed{ax + by + c = 0}$

where a, b & c are some constants. (they are not x or y intercepts)

$ax + by = -c$ $\Rightarrow$ Dividing this eq^n by $(-c)$

$$-\frac{a}{c} \cdot x + \left(\frac{-b}{c}\right) \cdot y = 1$$

$$\frac{x}{\left(\frac{-c}{a}\right)} + \frac{y}{\left(\frac{-c}{b}\right)} = 1$$

comparing this with intercept form

$\boxed{x\text{-intercept} = -\dfrac{c}{a}}$ & $\boxed{y\text{-intercept} = -\dfrac{c}{b}}$

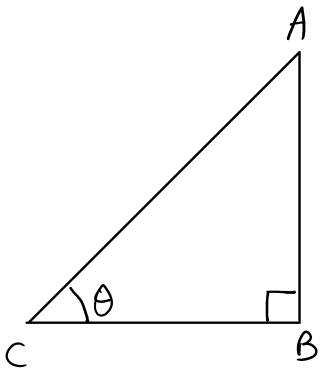
To find the slope, we need to get the general form into $y = mx + c$ kind of form.

$\therefore \; ax + by + c = 0 \Rightarrow by = -ax - c$

$$\therefore \; y = \underbrace{\left(-\frac{a}{b}\right)}_{\text{slope}} \cdot x - \frac{c}{b}$$

$$\boxed{\therefore \; \text{slope} = -\frac{a}{b}}$$

* Basics of Trigonometry



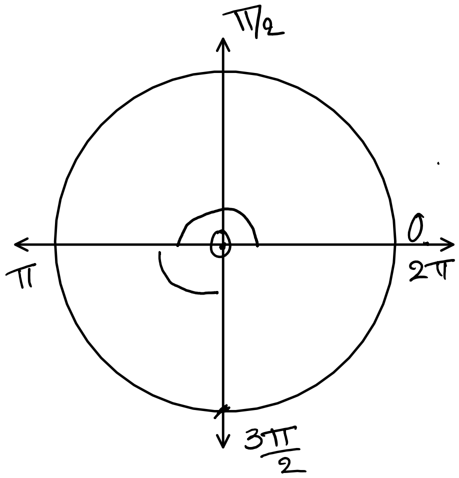
$$\boxed{\begin{array}{ll} \sin\theta = \dfrac{\text{Opposite Side}}{\text{Hypotenuse}} & \tan\theta = \dfrac{\sin\theta}{\cos\theta} \\[2ex] \cos\theta = \dfrac{\text{Adjacent Side}}{\text{Hypotenuse}} & \tan\theta = \dfrac{\text{Opposite Side}}{\text{Adjacent Side}} \end{array}}$$

$\sin\theta = \dfrac{AB}{AC}$ $\updownarrow$ $\boxed{\operatorname{cosec}\theta = \dfrac{AC}{AB}}$

$\cos\theta = \dfrac{BC}{AC}$ $\updownarrow$ $\boxed{\sec\theta = \dfrac{AC}{BC}}$

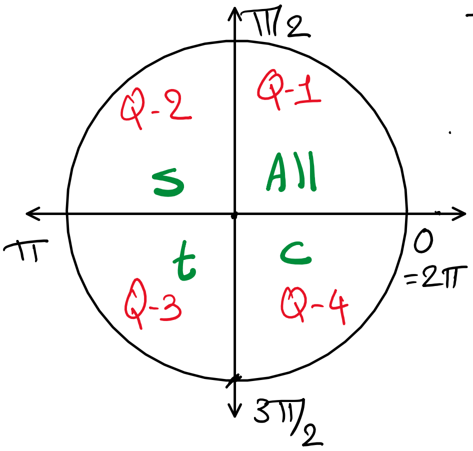
$\tan\theta = \dfrac{AB}{BC}$ $\updownarrow$ $\boxed{\cot\theta = \dfrac{BC}{AB}}$

→ **Units to measure an angle** – Degree & Radian



Degrees	Radians	Degrees	Radians
180	π	45	$\pi/4$
360	2π	30	$\pi/6$
90	$\pi/2$	270	$3\pi/2$
60	$\pi/3$	120	← $2\pi/3$

→ All | S | T | C Rule -



In Q-1 : All trigonometric ratios are +ve

In Q-2 : Only $\sin\theta$ is +ve

In Q-3 : Only $\tan\theta$ is +ve

In Q-4 : Only $\cos\theta$ is +ve

→ $(\pi \pm \theta)$ Rule & $(\frac{\pi}{2} \pm \theta)$ Rule -

$$\text{any-trig-}f^n(\pi \pm \theta) = \underbrace{\pm}_{\text{determined by All|s|t|c Rule}} \text{same-trig-}f^n(\theta)$$

$$\text{any-trig-}f^n\left(\frac{\pi}{2} \pm \theta\right) = \pm\, \underbrace{\text{function-changes}}(\theta)$$

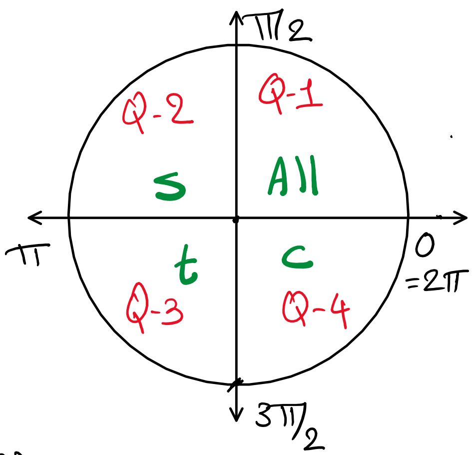
sin → cos	cosec → sec	sin ↔ cos
cos → sin	sec → cosec	tan ↔ cot
tan → cot	cot → tan	cosec ↔ sec

Examples of $(\pi \pm \theta)$ Rule :-

$\sin(\pi + \theta) = -\sin(\theta)$

function doesn't change

By doing $\pi + \theta$, we fall in Q-3 where 'sin' is -ve.



$\tan(\pi + \theta) = +\tan(\theta)$

$\sec(\pi + \theta) = -\sec\theta$

$\sin(\pi - \theta) = +\sin(\theta)$

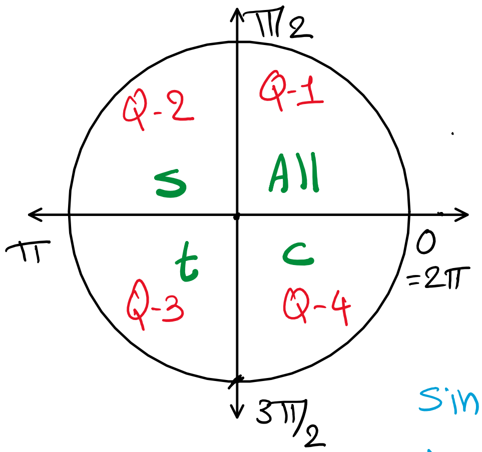
$\cot(\pi + \theta) = +\cot\theta$

$\text{cosec}(\pi - \theta) = +\text{cosec}(\theta)$

$$\operatorname{cot}(\pi + \theta) = +\cot\theta$$

$$\operatorname{cosec}(\pi - \theta) = +\operatorname{cosec}(\theta)$$

Examples of $\left(\frac{\pi}{2} \pm \theta\right)$ Rule :



$$\sin\left(\frac{\pi}{2} + \theta\right) = +\cos(\theta)$$

$$\cos\left(\frac{\pi}{2} + \theta\right) = -\sin(\theta)$$

sin ↔ cos

tan ↔ cot

cosec ↔ sec

$$\tan\left(\frac{\pi}{2} - \theta\right) = \cot(\theta)$$

	0	$30^\circ = \pi/6$	$45^\circ = \pi/4$	$60^\circ = \pi/3$	$90^\circ = \pi/2$
sin	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
cos	1	$\frac{\sqrt{3}}{2}$	$1/\sqrt{2}$	$\frac{1}{2}$	0
tan $\frac{\sin\theta}{\cos\theta}$	0	$\frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$ $\frac{1}{\sqrt{3}}$	1	$\frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}}$ $\sqrt{3}$	∞

	0	30	45	60	90
sin					
cos					
tan					
cosec					
sec					
cot					