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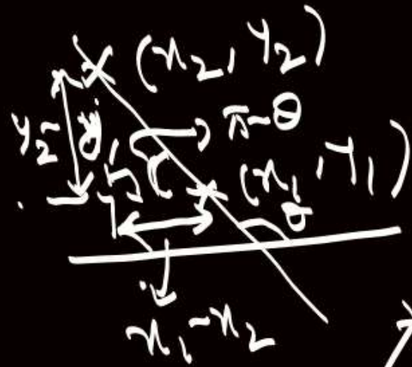
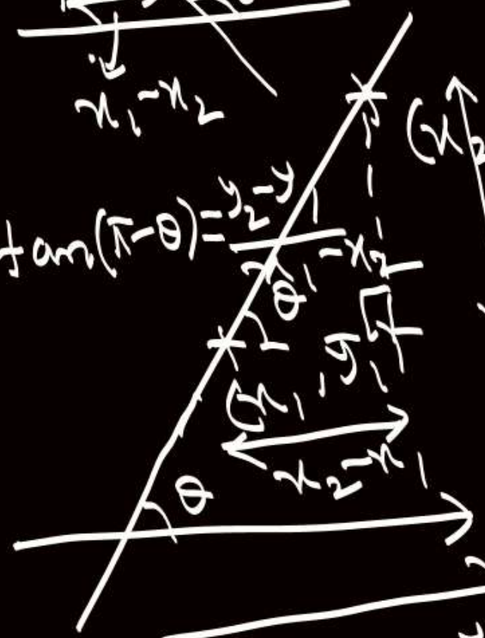
Straight Line

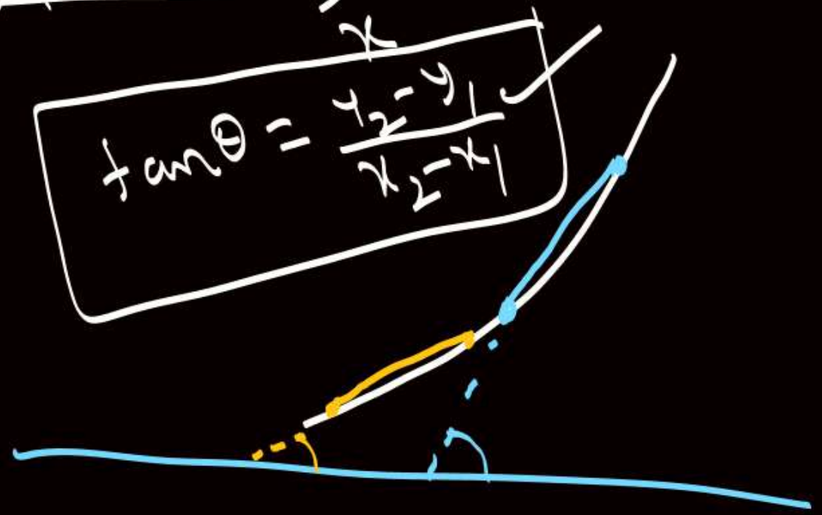
Inclination of line



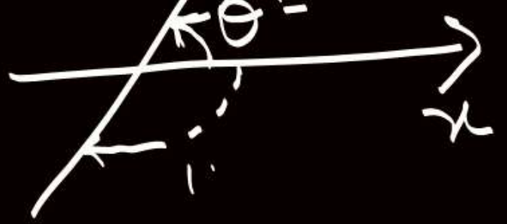
$\tan(\pi-\theta) = \frac{y_2-y_1}{x_1-x_2}$

$\tan\theta = \frac{y_2-y_1}{x_2-x_1}$

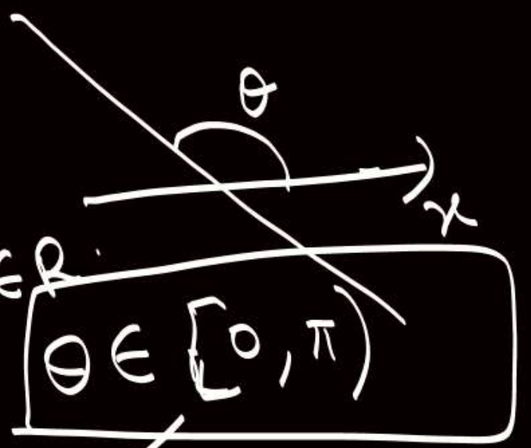




$\theta =$



$\theta \in R$

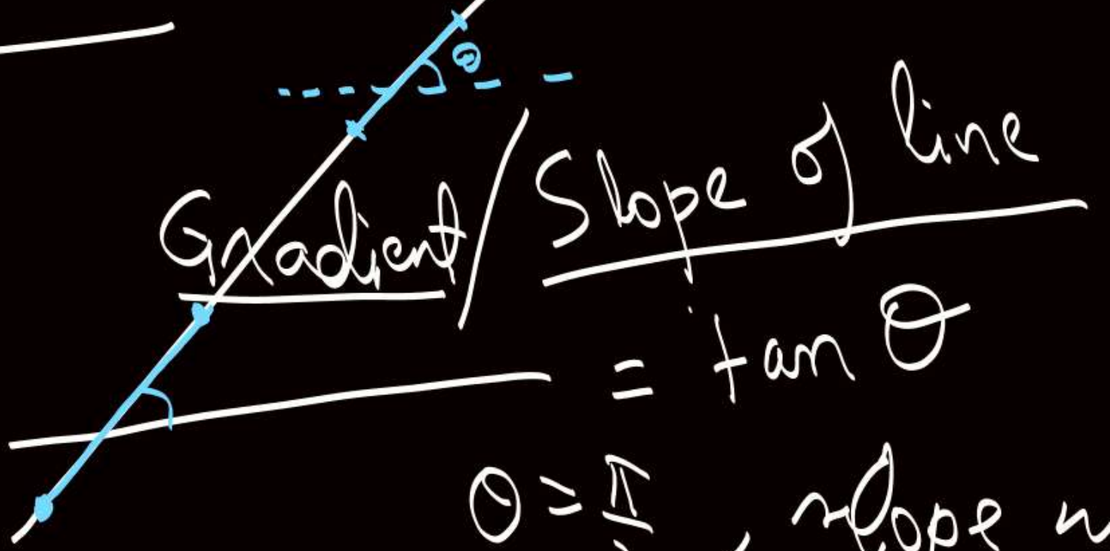


$\theta \in [0, \pi)$

Gradient / Slope of line

$= \tan\theta$

$\theta = \frac{\pi}{2}$, slope not defined



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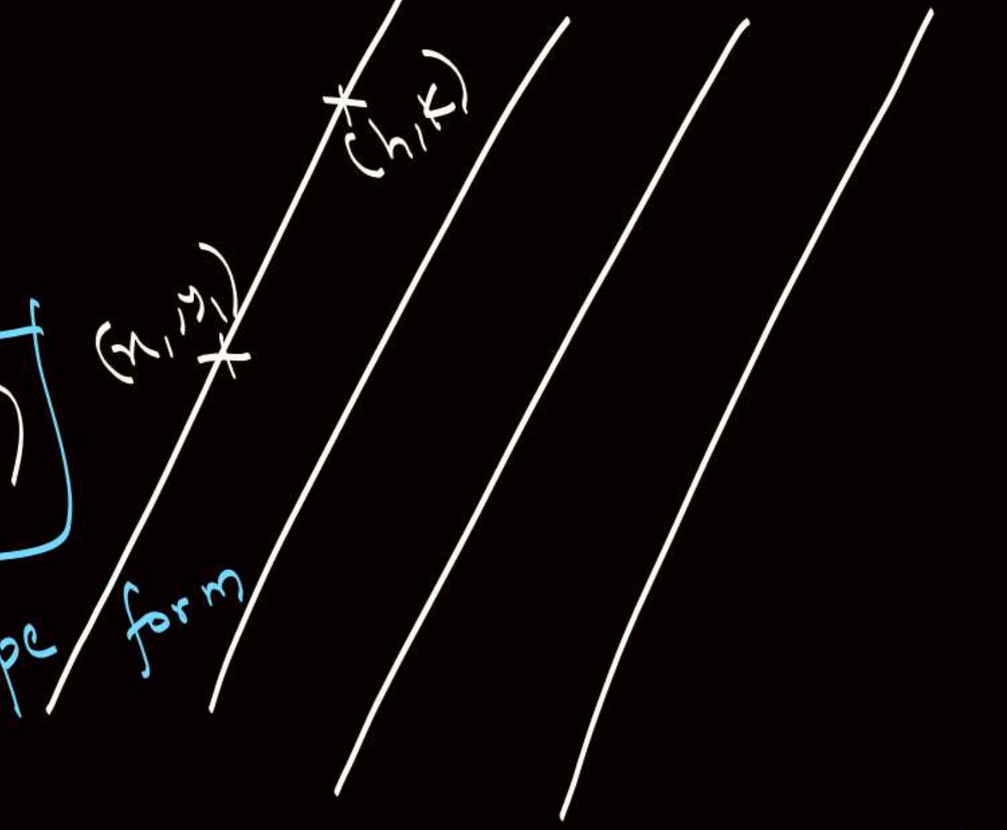
Equation of Line

Given : m = slope ; one point on line (x_1, y_1)

$$\frac{y-y_1}{x-x_1} = m$$

$$y - y_1 = m(x - x_1)$$

Point, slope form



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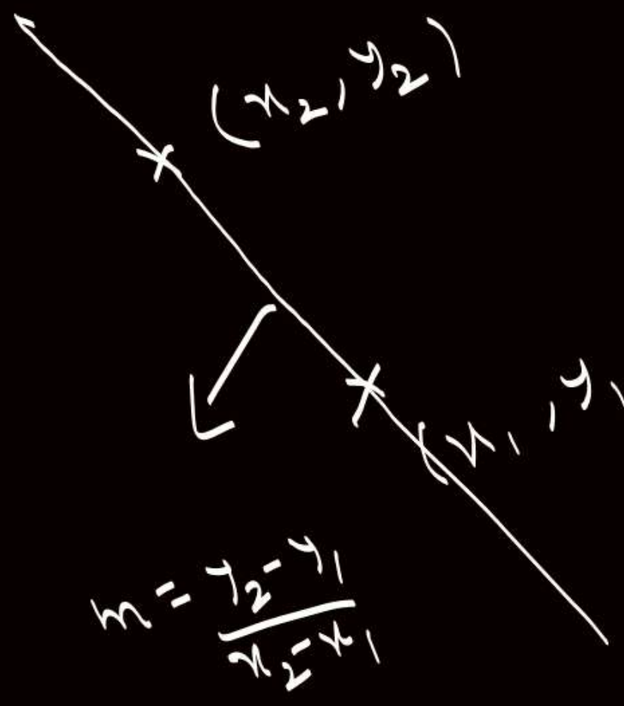
Two Point form

Given : Two points lying on line $(x_1, y_1), (x_2, y_2)$.



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

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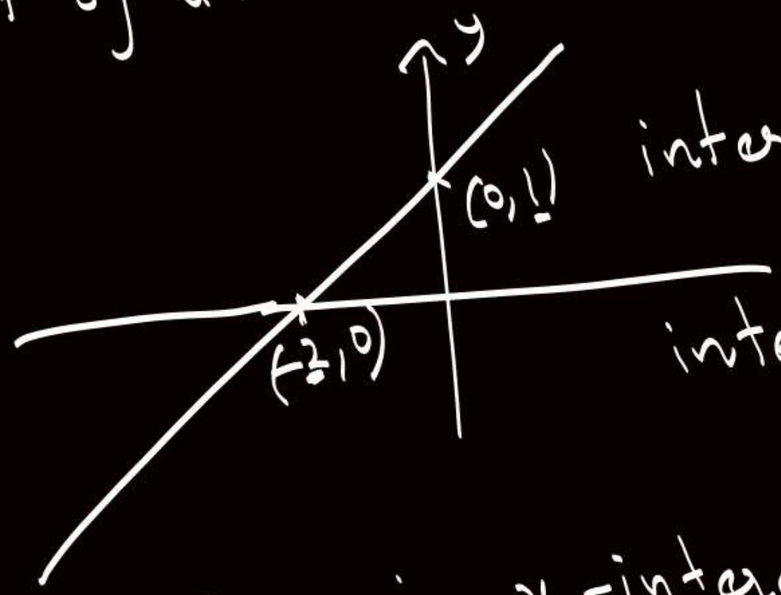
Intercept form

Intercept of line on coordinate axes



intercept on x-axis $= -2$

intercept on y-axis $= 1$

$ab \neq 0$

Given: x-intercept $= a$ $\quad (a,0)$

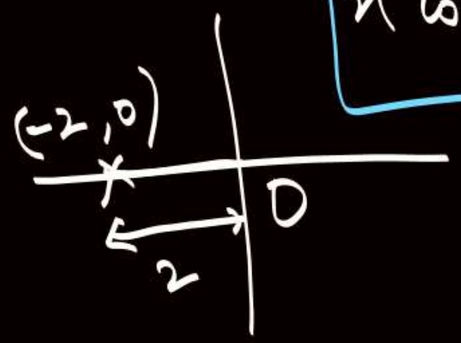
y-intercept $= b$ $\quad (0,b)$

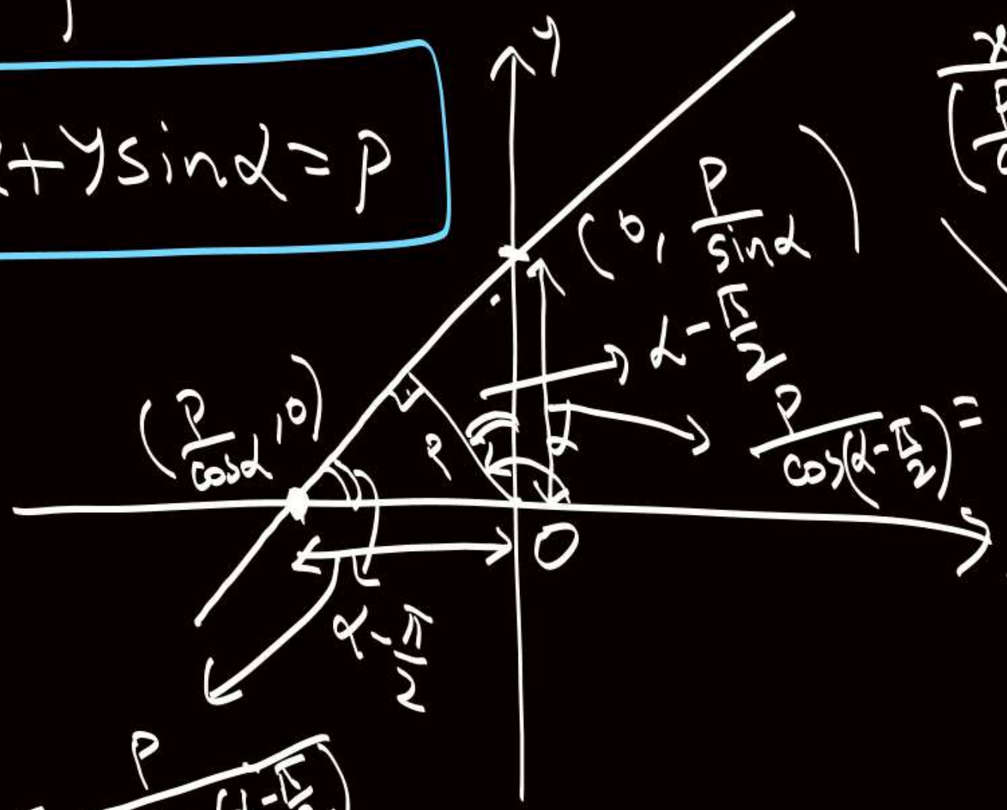
$$\frac{x}{a}+\frac{y}{b}=1 \iff ay+bx=ab \iff y-b=\frac{b-0}{0-a}(x-0)=-\frac{b}{a}x$$

Normal form

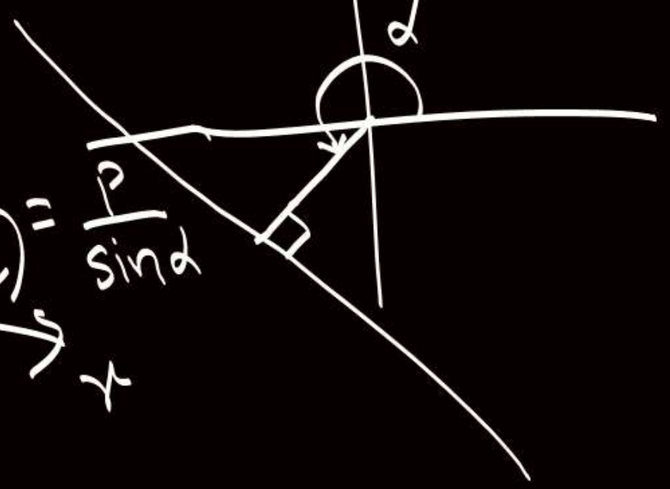
Given: perpendicular distance of line 'p' from origin, and angle which $\perp$ar makes with +ive x-axis 'α'.

$$x\cos\alpha + y\sin\alpha = p$$





$$\frac{x}{\left(\frac{p}{\cos\alpha}\right)} + \frac{y}{\left(\frac{p}{\sin\alpha}\right)} = 1$$



General form

$$ax + by + c = 0$$ ✓

$$y - y_1 = m(x - x_1)$$

$$y = 3x + 7.$$

$$y - mx + mx_1 - y_1 = 0$$

$$m = -\frac{\text{Coeff of } x}{\text{Coeff of } y}$$

$$\text{slope} = -\frac{\text{Coefficient of } x}{\text{Coefficient of } y} = -\frac{a}{b}$$

$\therefore$

Express the eqn. of line $2x - 3y + 7 = 0$ in normal form.

$$\frac{2x}{\sqrt{2^2+3^2}} - \frac{3y}{\sqrt{2^2+3^2}} + \frac{7}{\sqrt{2^2+3^2}} = 0$$

$x\cos\alpha + y\sin\alpha = p$

$$-\frac{2x}{\sqrt{13}} + \frac{3y}{\sqrt{13}} = \frac{7}{\sqrt{13}}$$

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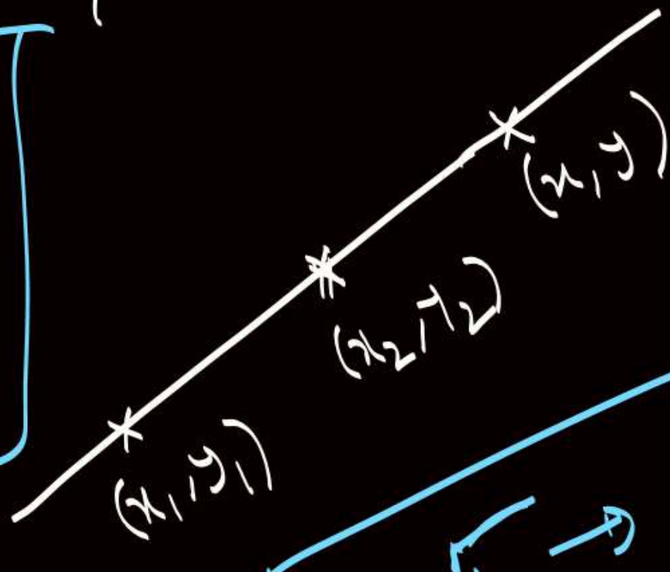
Determinant form

Given: Two points lying on line (x_1, y_1) & (x_2, y_2)

$$\begin{vmatrix} x & y & 1 \\ x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \end{vmatrix} = 0$$



Ex-5 → Determinants

Ex-3