10.4 General equation of a straight line and its transformation in standard forms

General form of equation of a line is $ax + by + c = 0$, its

(1) **Slope intercept form:** $y = -\frac{a}{b}x - \frac{c}{b}$, slope $m = -\frac{a}{b}$ and intercept on *y*-axis is, $C = -\frac{c}{b}$.

(2) **Intercept form :** $\frac{x}{-c/a} + \frac{y}{-c/b} = 1$, *x* intercept is $= \left(-\frac{c}{a}\right)$ and *y* intercept is $= \left(-\frac{c}{b}\right)$.

(3) **Normal form :** To change the general form of a line into normal form, first take *c* to right hand side and make it positive, then divide the whole equation by $\sqrt{a^2 + b^2}$ like

$$-\frac{ax}{\sqrt{a^2+b^2}} - \frac{by}{\sqrt{a^2+b^2}} = \frac{c}{\sqrt{a^2+b^2}},$$

where $\cos\sim = -\frac{a}{\sqrt{a^2+b^2}}$, $\sin\sim = -\frac{b}{\sqrt{a^2+b^2}}$, $p = \frac{c}{\sqrt{a^2+b^2}}$

Point of intersection of two lines

Point of intersection of two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is given by

$$(x', y') = \left(\frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1}, \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}\right) = \left(\frac{\begin{vmatrix} b_1 & b_2 \\ c_1 & c_2 \end{vmatrix}}{\begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}}, \frac{\begin{vmatrix} c_1 & c_2 \\ a_1 & a_2 \end{vmatrix}}{\begin{vmatrix} a_1 & a_2 \\ b_1 & b_2 \end{vmatrix}}\right)$$