10.8 Position of a point with respect to a line

Let the given line be $ax + by + c = 0$ and observing point is (x_1, y_1), then

(i) If the same sign is found by putting in equation of line $x = x_1, y = y_1$ and $x = 0$, $y = 0$ then the point (x_1, y_1) is situated on the same side of origin.

(ii) If the opposite sign is found by putting in equation of line $x = x_1$, $y = y_1$ and $x = 0$, $y = 0$ then the point (x_1, y_1) is situated opposite side to origin.

Position of two points with respect to a line

Two points (x_1, y_1) and (x_2, y_2) are on the same side or on the opposite side of the straight line $ax + by + c = 0$ according as the values of $ax_1 + by_1 + c$ and $ax_2 + by_2 + c$ are of the same sign or opposite sign.

Concurrent lines

Three or more lines are said to be concurrent lines if they meet at a point.

First method : Find the point of intersection of any two lines by solving them simultaneously. If the point satisfies the third equation also, then the given lines are concurrent.

Second method : The three lines $a_1x + b_1y + c_1 = 0$, $a_2x + b_2y + c_2 = 0$ and $a_3x + b_3y + c_3 = 0$ are concurrent if, $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$.

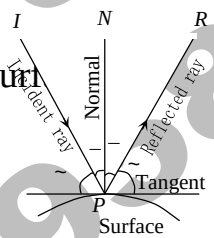
Third method : The condition for the lines $P = 0$, $Q = 0$ and $R = 0$ to be concurrent is that three constants a, b, c (not all zero at the same time) can be obtained such that $aP + bQ + cR = 0$.

Reflection on the surface

Here, IP = Incident Ray

PN = Normal to the surface

PR = Reflected Ray



Then, $\angle IPN = \angle NPR$

Angle of incidence = Angle of reflection