

2.3 Lines (cont)

④ Point-slope form

An equation of a nonvertical line with slope m and containing the point (x_1, y_1) is:

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

Ex: Find an equation of a line
① passing through $(-6, 5)$ with
slope of $-\frac{2}{3} = m$ x_1, y_1

$$y - 5 = -\frac{2}{3}(x - -6)$$

$$y - 5 = -\frac{2}{3}(x + 6)$$

$$y - 5 = -\frac{2}{3}x - 4$$

$$y = -\frac{2}{3}x + 1$$

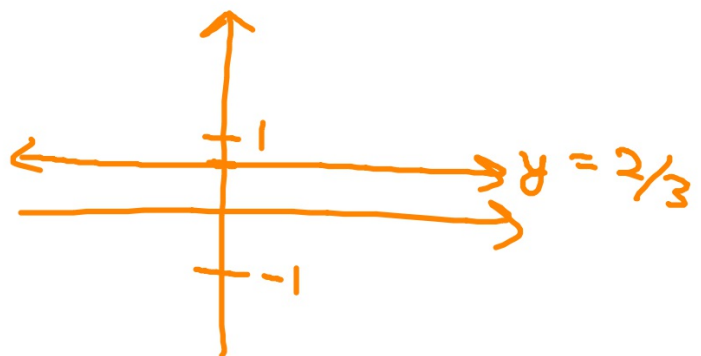
② Find the equation of a horizontal line containing the point $(-\frac{1}{2}, \frac{2}{3})$

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

$$y - \frac{2}{3} = 0(x + \frac{1}{2})$$

$$y - \frac{2}{3} = 0$$

$$y = \frac{2}{3}$$



Note: Equation of a horizontal line is of the form: $y = B$ where B is the y -intercept.

⑤ Find the equation of the line given two points.

Ex: Find the equation of the line passing through the points $(-1, -3)$ and $(3, 1)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{(-3) - (1)}{(-1) - (3)} = \frac{-4}{-4} = 1$$

$$y - 1 = 1(x - 3)$$

$$\begin{array}{ccc} y - 1 & = & x - 3 \\ +1 & & +1 \end{array}$$

$$y = \underline{1}x - \underline{2}$$

⑥ Write equation in slope-intercept form

An equation of a line with slope m and y -int. $(0, B)$ is written as:

$$y = \underline{m}x + \underline{B}$$

⑦ General Form:

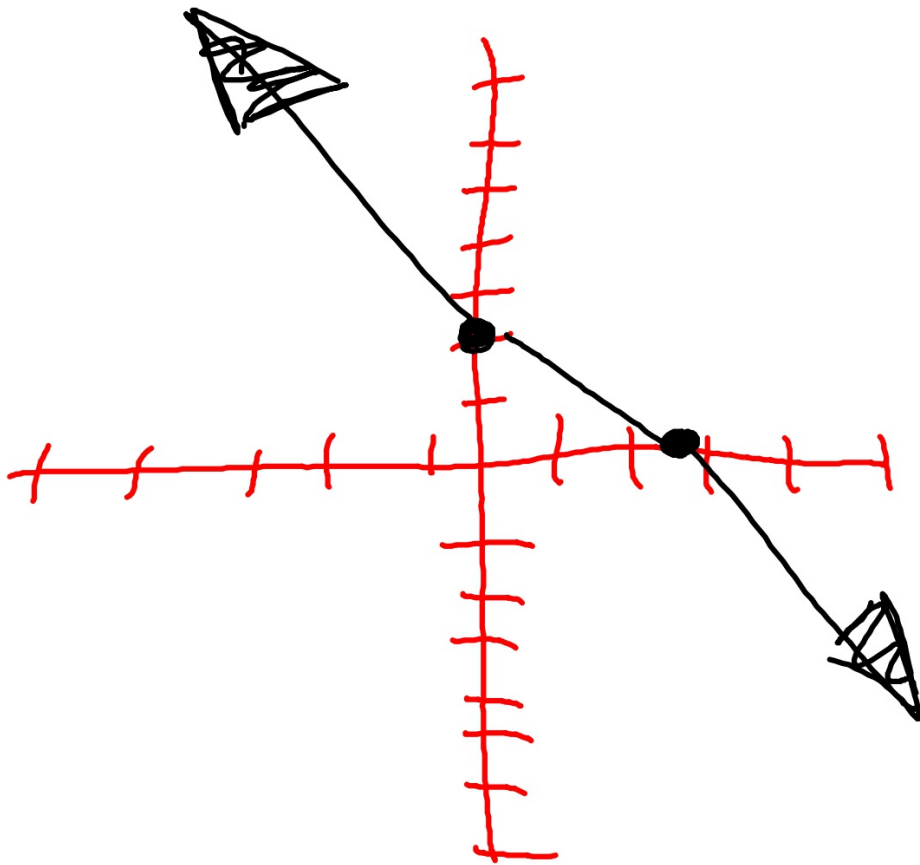
$Ax + By = C$, where $A, B,$ and C
are real numbers.

Ex: Graph by finding the intercepts

$$\begin{aligned} 3x + 4y &= 8 \\ \cancel{3(0)} + 4y &= 8 \\ 4y &= 8 \end{aligned}$$

$$y = 2$$

$$\begin{aligned} 3x + 4(0) &= 8 \\ 3x &= 8 \\ x &= 8/3 \end{aligned}$$



⑧ Parallel & Perpendicular lines

i) Two nonvertical lines are parallel if and only if (iff) they have the same slopes and different y-intercepts.

ii) Two non-vertical lines are perpendicular if product of their slopes is -1 .
reciprocal & opposites Ex: $m_1 = -4$ $m_2 = +\frac{1}{4}$

Ex: Find the equation of the line passing through $(-5, 0)$ and that is perpendicular to the line with equation $5x + 3y = 18$

Point: (x_1, y_1)
 $(-5, 0)$

Slope: $m = \frac{3}{5}$

$$y - (-5) = \frac{3}{5}(x - 0)$$

$$y + 5 = \frac{3}{5}x$$

$$\boxed{y = \frac{3}{5}x - 5}$$

$$\frac{3y}{3} = -\frac{5x}{3} + \frac{18}{3}$$

$$y = \underbrace{\left(-\frac{5}{3}\right)}_m x + 6$$