

## Equations of Lines

Slope-Intercept Form:

y-int.

$$y = mx + b$$

$$y + 2 = 3(x - 5)$$

$$y + 2 = 3x - 15$$

$$\boxed{y = 3x - 17}$$

Slope-Point Form:

$$m = 3 \quad (5, -2)$$

$$x_1 = 5$$

$$y_1 = -2$$

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

$$y - (-2) = 3(x - 5)$$

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

General Form:

$$-3x + y + 17 = 0$$

$$\boxed{3x - y - 17 = 0}$$

$$ax + by + c = 0$$

$$y = 3x - 17$$

$$\boxed{0 = 3x - y - 17}$$

Reminder!!!

Whenever you see the words  
**Parallel & Perpendicular** think  
 Slope

What is **Parallel** to  $\frac{2y}{2} = \frac{5x-8}{2}$        $m = \frac{5}{2}$

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

What is **Perpendicular** to  $3y+1 = 2x-5$

$m = \frac{2}{3}$        $\frac{3y}{3} = \frac{2x-6}{3}$

$m_{\perp} = -\frac{3}{2}$        $y = \frac{2}{3}x - 2$

Find the equation of a line parallel to  $3y=4x-1$  and passing through the point (4, 2).

① Find slope:

$$\frac{3y}{3} = \frac{4x-1}{3}$$

$$y = \frac{4x}{3} - \frac{1}{3}$$

$$m = \frac{4}{3}$$

$$m_{||} = \frac{4}{3}$$

② Find point:

$$(4, 2) \text{ Given}$$

$$x_1 = 4$$

$$y_1 = 2$$

③ Find equation:

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

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

Slope-Point Form

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

$$y - 2 = \frac{4x}{3} - \frac{16}{3}$$

$$y = \frac{4x}{3} - \frac{16}{3} + 2$$

$$y = \frac{4x}{3} - \frac{16}{3} + \frac{6}{3}$$

$$y = \frac{4x}{3} - \frac{10}{3}$$

Slope-Intercept Form.

$$y = \frac{4x}{3} - \frac{10}{3}$$

$$0 = \frac{4x}{3} - y - \frac{10}{3}$$

$$0 = 4x - 3y - 10$$

General Form

Determine the equation of a line perpendicular to  $4x+5y=7$  and having an x-intercept of  $-2$ .

① Find slope:

$$4x + 5y = 7$$

$$\frac{5y}{5} = \frac{-4x}{5} + \frac{7}{5}$$

$$y = \frac{-4x}{5} + \frac{7}{5}$$

$$m = -\frac{4}{5}$$

$$m_1 = \frac{5}{4}$$

② Find point:

x-intercept is  $-2$

$$(-2, 0)$$

$$x_1 = -2$$

$$y_1 = 0$$

③ Find equation:

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

$$y - 0 = \frac{5}{4}(x - (-2))$$

$$y - 0 = \frac{5}{4}(x + 2)$$

Slope-Point Form

$$y - 0 = \frac{5}{4}(x + 2)$$

$$y = \frac{5x}{4} + \frac{10}{4}$$

$$y = \frac{5x}{4} + \frac{5}{2}$$

Slope-Intercept Form

$$y = \frac{5x}{4} + \frac{5}{2}$$

$$0 = \frac{5x}{4} - y + \frac{5}{2}$$

$$0 = 5x - 4y + 10$$

General Form

Determine the equation of a horizontal line with a y-intercept of -3

① Find slope:

$$m = \frac{0}{1}$$

$$m = 0 \text{ (horizontal)}$$

② Find point:

$$(0, -3)$$

$$x_1 = 0$$

$$y_1 = -3$$

③ Find equation:

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

$$y - (-3) = 0(x - 0)$$

$$\boxed{y + 3 = 0(x - 0)}$$

Slope-Point Form

$$y + 3 = 0(x - 0)$$

$$y + 3 = 0x$$

$$y = 0x - 3$$

$$\boxed{y = -3}$$

Slope-Intercept Form

$$y = -3$$

$$\boxed{y + 3 = 0}$$

general form

$$y = mx + b \quad (\text{Slope intercept form})$$

$$ax + by + c = 0 \quad (\text{General form})$$

$$\text{Ex: } 4x + 5y - 10 = 0 \quad (\text{General form})$$

$$\frac{5y}{5} = \frac{-4x}{5} + \frac{10}{5}$$

$$y = -\frac{4}{5}x + 2 \quad (\text{Slope Intercept Form})$$


---

$$\text{Ex. } y = \frac{2}{3}x - 7 \quad (\text{Slope Intercept form})$$

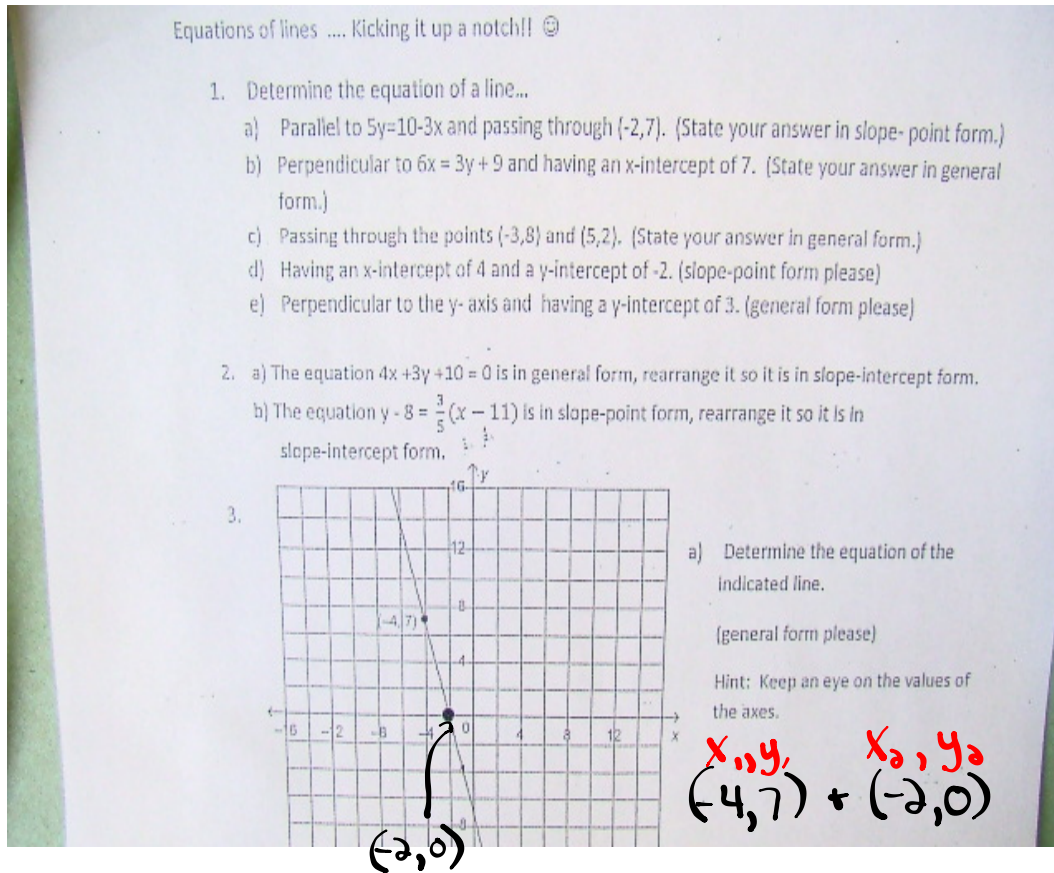
$$0 = \frac{2}{3}x - \frac{4}{1} + \frac{7}{1} \quad \text{common denominator} = 3$$

$$0 = 2x - 3y - 21 \quad (\text{General form})$$



Check out the sheet.

# Questions from Homework



(i) Slope

$$m = \frac{0-7}{-2-(-4)}$$

$$m = \frac{-7}{2}$$

(ii) Point

$$(-4, 7)$$

$$x_1 = -4$$

$$y_1 = 7$$

(iii) Equation:

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

$$y - 7 = -\frac{7}{2}(x - (-4))$$

$$y - 7 = -\frac{7}{2}(x + 4)$$

$$2 \cdot y - 7 = -\frac{7}{2} \cdot 2x - \frac{28}{2}$$

$$2y - 14 = -7x - 28$$

$$7x + 2y - 14 + 28 = 0$$

$$7x + 2y + 14 = 0$$



① a) Determine the equation of a line Parallel to  $5y = 10 - 3x$  and passing through  $(-2, 7)$

② Find Point  $x_1 = -2$   
 $y_1 = 7$

① Determine Slope

$$5y = 10 - 3x$$

$$\frac{5y}{5} = \frac{-3x + 10}{5}$$

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

$$m = -\frac{3}{5}$$

$$m_{||} = -\frac{3}{5}$$

③ Determine equation

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

$$y - 7 = -\frac{3}{5}(x - (-2))$$

$$y - 7 = -\frac{3}{5}(x + 2)$$

$$y - 7 = -\frac{3x}{5} - \frac{6}{5}$$

$$y = -\frac{3x}{5} - \frac{6}{5} + \frac{7}{1}$$

$$y = -\frac{3x}{5} - \frac{6}{5} + \frac{35}{5}$$

(Slope Intercept)  $y = -\frac{3}{5}x + \frac{29}{5}$

$$\frac{3}{5}x + y - \frac{29}{5} = 0 \quad \text{CD} = 5$$

(General form)  $3x + 5y - 29 = 0$

Determine the equation of a line...

① b) Perpendicular to  $6x = 3y + 9$  and have an x-intercept of 7 (Answer in general form)

① Find Slope:

$$6x = 3y + 9$$

$$\frac{-3y}{-3} = \frac{-6x + 9}{-3}$$

$$y = 2x - 3$$

$$m = 2$$

$$m_{\perp} = -\frac{1}{2}$$

(ii) Find Point

$$x\text{-intercept} = 7$$

$$(7, 0)$$

$$x_1 = 7$$

$$y_1 = 0$$

(iii) Find equation

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

$$y - 0 = -\frac{1}{2}(x - 7)$$

$$2 \cdot y = \frac{-1x + 7}{2}$$

$$2y = -1x + 7$$

$$x + 2y - 7 = 0$$

Determine the equation of a line . . .

① c) Passing through the points  $(-3, 8)$  and  $(5, 2)$   
(Answer in general form)

(i) Find slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{2 - 8}{5 - (-3)}$$

$$m = \frac{-6}{8} = \left(\frac{-3}{4}\right)$$

(ii) Point

$$(-3, 8)$$

$$x_1 = -3$$

$$y_1 = 8$$

(iii) Find equation:

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

$$y - 8 = \frac{-3}{4}(x - (-3))$$

$$y - 8 = \frac{-3}{4}(x + 3)$$

$$4(y - 8) = 4 \cdot \frac{-3x}{4} + \frac{4 \cdot 9}{4}$$

$$4y - 32 = -3x - 9$$

$$3x + 4y - 32 + 9 = 0$$

$$\boxed{3x + 4y - 23 = 0}$$

Determine the equation of a line . . .

① d) Having an x-intercept of 4 and a y-intercept of -2  
 (Answer in Slope Point form)

(i) Find slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-2 - 0}{0 - 4}$$

$$m = \frac{-2}{-4} = \frac{1}{2}$$

(ii) Point:

$$(4, 0)$$

$$x_1 = 4$$

$$y_1 = 0$$

(iii) Equation:

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

$$y - 0 = \frac{1}{2}(x - 4)$$

Determine the equation of a line . . .

Qes) Perpendicular to the y-axis and having a y-intercept of 3 (Answer in general form)

(i) Slope:

$$\text{Slope of y-axis} = \frac{1}{0}$$

$$m = \frac{1}{0}$$

$$m_{\perp} = \frac{0}{-1} = \textcircled{0}$$

(ii) Point:

$$\text{y-intercept} = 3$$

$$(0, 3)$$

$$x_1 = 0$$

$$y_1 = 3$$

(iii) Equation:

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

$$y - 3 = 0(x - 0)$$

$$y - 3 = 0 - 0$$

$$\boxed{y - 3 = 0}$$

② a)  $4x + 3y + 10 = 0$  (General Form)

$$\frac{3y}{3} = -\frac{4x}{3} - \frac{10}{3}$$

$$\boxed{y = -\frac{4x}{3} - \frac{10}{3}}$$
 (Slope Intercept Form)

$$m = -\frac{4}{3} \text{ (Slope)}$$

$$b = -\frac{10}{3} \text{ (y-intercept)}$$

$$\textcircled{a} \text{ b) } y - 8 = \frac{3}{5}(x - 11) \quad (\text{Slope-Point Form})$$

$$y - 8 = \frac{3x - 33}{5}$$

$$y = \frac{3x}{5} - \frac{33}{5} + \frac{8}{1} \quad (\text{get a common denominator})$$

$$y = \frac{3x}{5} - \frac{33}{5} + \frac{40}{5}$$

$$\boxed{y = \frac{3x + 7}{5}}$$

(Slope Intercept Form)

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

$$b = \frac{7}{5}$$