

To find the equation of any line:

① Find the slope: m

② Find the point: (x_1, y_1)

③ Find the equation: $y - y_1 = m(x - x_1)$
Slope-Point Form

$y = mx + b$
Slope-Intercept Form

$ax + by + c = 0$
General Form

Determine the equation of a line
perpendicular to $4x+5y=7$ and having
the same x-intercept as $10x+7y=-20$.
 (Use Slope-Intercept form)

① Find Slope:
 $4x+5y=7$

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

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

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

$$m_{\perp} = \frac{5}{4}$$

② Find point:
 x-int ($y=0$)

$$10x+7y=-20$$

$$10x+7(0)=-20$$

$$10x+0=-20$$

$$\frac{10x}{10} = \frac{-20}{10}$$

$$x = -2$$

$$\text{x-int: } (-2, 0)$$

$$x_1 = -2$$

$$y_1 = 0$$

③ Find equation:

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

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

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

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

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

Slope-Intercept
 form

Determine the equation of a horizontal line passing through the same point on the y-axis as $3y = 6x - 9$

(Use General Form)

① Find Slope:
horizontal line

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

② Find point:
y-int ($x=0$)

$$3y = 6x - 9$$

$$3y = 6(0) - 9$$

$$\frac{3y}{3} = \frac{-9}{3}$$

$$y = -3$$

$$(0, -3)$$

$$x_1 = 0$$

$$y_1 = -3$$

③ Find equation:

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

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

$$y + 3 = 0$$

General Form

Given: M(3, 5), U(-2, -1), and D(0, 4)

Find the equation of a line parallel to MD and passing through U.

(Use Slope-Point form)

① Find slope:

$$m_{MD} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m_{MD} = \frac{4 - 5}{0 - 3}$$

$$m_{MD} = \frac{-1}{-3}$$

$$m_{MD} = \frac{1}{3}$$

$$m_{||} = \frac{1}{3}$$

② Find point:

Use point U

$$(-2, -1)$$

$$x_1 = -2$$

$$y_1 = -1$$

③ Find equation:

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

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

Slope-Point form

Homework:

① Given:

point: $(-2, 7)$

(i) Find slope

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

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

$$y = mx + b$$

$$m = 4$$

$$m_{11} = 4$$

(ii) Point:

$(-2, 7)$

$$x_1 = -2$$

$$y_1 = 7$$

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

$$y - 7 = 4(x - (-2))$$

$$y - 7 = 4(x + 2)$$

$$y - 7 = 4x + 8$$

$$y = 4x + 8 + 7$$

$$\boxed{y = 4x + 15}$$

slope intercept form

$$\boxed{0 = 4x - y + 15}$$

general form

② Given:
(4,3)

(i) Find slope

$$\frac{-y}{-1} = \frac{-5x+8}{-1} \quad \frac{1}{-1}$$

$$y = \underline{5}x - 8$$

$$m = \frac{5}{1}$$

$$m_{\perp} = -\frac{1}{5}$$

(ii) Point:

(4,3)

$$x_1 = 4$$

$$y_1 = 3$$

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

$$y - 3 = -\frac{1}{5}(x - 4)$$

$$y - 3 = \frac{-1x}{5} + \frac{4}{5} \quad \text{co. 5}$$

$$5y - 15 = -1x + 4$$

$$\boxed{x + 5y - 19 = 0} \quad \text{general form}$$

③ Given:

x-int of 3 \rightarrow (3,0)y-int of -4 \rightarrow (0,-4) $b = -4$ (i) Find m :

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

$$m = \frac{-4 - 0}{0 - 3}$$

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

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

$$b = -4$$

(ii) Point:

$$(3,0)$$

$$x_1 = 3$$

$$y_1 = 0$$

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

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

$$y = \frac{4x}{3} - \frac{12}{3}$$

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

$$\left. \begin{array}{l} m = \frac{4}{3} \\ b = -4 \end{array} \right\} y = \frac{4}{3}x - 4$$

④ Given:

$$(6, 2) \quad x_1 = 6 \quad y_1 = 2$$

$$(1, -5) \quad x_2 = 1 \quad y_2 = -5$$

(i) Find slope.

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

$$m = \frac{-5 - 2}{1 - 6}$$

$$m = \frac{-7}{-5} = \frac{7}{5}$$

(ii) Point:

$$(6, 2)$$

$$x_1 = 6$$

$$y_1 = 2$$

$$(iii) \quad y - y_1 = m(x - x_1)$$

$$y - 2 = \frac{7}{5}(x - 6)$$

$$y - 2 = \frac{7x}{5} - \frac{42}{5}$$

$$5y - 10 = 7x - 42$$

$$0 = 7x - 42 - 5y + 10$$

$$\text{general form } \boxed{0 = 7x - 5y - 32}$$

$$5y = 7x - 32$$

$$\text{Slope-int form } \boxed{y = \frac{7x}{5} - \frac{32}{5}}$$

⑤ Given:

Point: $(4, -3)$ $x_1 = 4$ $y_1 = -3$

(i) Find Slope

$$2(y-1) = 10x-4$$

$$2y-2 = 10x-4$$

$$2y = 10x-4+2$$

$$\frac{2y}{2} = \frac{10x-2}{2}$$

$$y = 5x-1$$

$$m = 5$$

$$m_{\perp} = 5$$

(ii) Point:

$(4, -3)$

$$x_1 = 4$$

$$y_1 = -3$$

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

$$y - -3 = 5(x - 4)$$

$$y + 3 = 5x - 20 - 3$$

$$\boxed{y = 5x - 23}$$

6) Given

$$(-2, 6) \quad x_1 = -2 \quad y_1 = 6$$

(i) Slope:

horizontal line: $m = \frac{0}{1}$

$$m = 0$$

(ii) Point:

$$(-2, 6)$$

$$x_1 = -2$$

$$y_1 = 6$$

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

$$y - 6 = 0(x - (-2))$$

$$y - 6 = 0(x + 2)$$

$$\boxed{y - 6 = 0}$$

⑦ Given:
 $(8, -1)$ $x_1 = 8$ $y_1 = -1$

(i) Slope:

Vertical line: $m = \frac{1}{0}$

(ii) Point

$(8, -1)$

$x_1 = 8$

$y_1 = -1$

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

$$y - (-1) = \frac{1}{0}(x - 8)$$

$$\frac{y+1}{1} = \frac{x-8}{0}$$

$$0(y+1) = 1(x-8)$$

$$\boxed{0 = x - 8}$$

Examples:

- x-intercept of 2 \rightarrow (2, 0)
- y-intercept of -6 \rightarrow (0, -6)

Slope point form:
 $y = mx + b$

General form:
 $ax + by + c = 0$

$$m = \frac{y_2 - y_1}{x_2 - x_1} \quad | \quad y - y_1 = m(x - x_1) \quad | \quad y = mx + b$$

Equations of Lines - Review

$$\textcircled{1} \quad x + 2y - 6 = 0$$

$$\textcircled{4} \quad y - 3 = 0$$

$$\textcircled{2} \quad 5x + y + 25 = 0$$

$$\textcircled{5} \quad y = 6x + 8$$

$$\textcircled{3} \quad y - 3 = -\frac{4}{7}(x + 5)$$

$$\textcircled{6} \quad 2x - 3y + 6 = 0$$

$$\text{or } y + 1 = -\frac{4}{7}(x - 2)$$

Name: _____

Equations of Lines - Review

1. Determine the equation of a line perpendicular to $4y - 1 = 8x - 5$ and passing through $(-4, 5)$.
Please state your answer in General Form.

(1) $4y - 1 = 8x - 5$
 $4y = 8x - 4$
 $y = 2x - 1$
 $m = 2$
 $m_{\perp} = -\frac{1}{2}$

(2) $y - y_1 = m(x - x_1)$
 $y - 5 = -\frac{1}{2}(x + 4)$
 $y - 5 = -\frac{1}{2}x - 2$
 $2y - 10 = -1x - 4$

x_1, y_1
 $x + 2y - 6 = 0$

2. Determine the equation of a line parallel to $5 - 2y = 10x + 7$ and having an x-intercept of -5 . $(-5, 0)$
Please state your answer in General Form.

(1) $5 - 2y = 10x + 7$
 $-2y = 10x + 2$
 $y = -5x - 1$
 $m = -5$
 $m_{||} = -5$

(2) $y - y_1 = m(x - x_1)$
 $y - 0 = -5(x + 5)$
 $y = -5x - 25$

$5x + y + 25 = 0$

3. Determine the equation of a line...

$m_{11} = -5$

3. Determine the equation of a line passing through the points $(-5, 3)$ and $(2, -1)$.
Please state your answer in **Slope - Point Form**.

(i) $m = \frac{y_2 - y_1}{x_2 - x_1}$
 $m = \frac{-1 - 3}{2 - (-5)}$
 $m = \frac{-4}{7}$

(ii) $y - y_1 = m(x - x_1)$
 $y + 1 = \frac{-4}{7}(x - 2)$
 $y + 1 = \frac{-4x + 8}{7}$
 $y = \frac{-4x + 8}{7} - 1$
 $y = \frac{-4x + 8 - 7}{7}$
 $y = \frac{-4x + 1}{7}$

4. Determine the equation of a **horizontal** line passing through $(7, 3)$.
Please state your answer in **General Form**. (x, y)

(i) horizontal line: $m = \frac{0}{1}$

(ii) $y - y_1 = m(x - x_1)$
 $y - 3 = 0(x - 7)$
 $y - 3 = 0$

5. Determine the equation of a line with a slope parallel to $4(y - 2) = 24x - 32$ and a y -intercept of 8. Please state your answer in **Slope- Intercept Form**.

(i) $4(y - 2) = 24x - 32 \rightarrow y = 6x - 6$

(ii) $y - y_1 = m(x - x_1) \rightarrow y = 6x + 8$

$y - 3 = 0$

5. Determine the equation of a line with a slope parallel to $4(y - 2) = 24x - 32$ and a ~~(0,8)~~ y-intercept of 8. Please state your answer in **Slope-Intercept Form**.

(1) $4(y - 2) = 24x - 32$ \rightarrow $y = 6x - 6$ (1) $y - y_1 = m(x - x_1)$ \rightarrow $y = 6x + 8$
 $4y - 8 = 24x - 32$ \rightarrow $m = 6$ $y - 8 = 6(x - 0)$
 $4y = 24x - 24$ \rightarrow $m_{||} = 6$ $y - 8 = 6x - 0$

6. Determine the equation of a line that has an x-intercept of -3 and a y-intercept of 2. Please state your answer in **General Form**. $(-3, 0) + (0, 2)$

(1) $m = \frac{y_2 - y_1}{x_2 - x_1}$ (1) $y - y_1 = m(x - x_1)$
 $m = \frac{2 - 0}{0 - (-3)}$ $y - 0 = \frac{2}{3}(x + 3)$
 $m = \frac{2}{3}$ $y = \frac{2}{3}x + \frac{6}{3}$ \rightarrow $2x - 3y + 6 = 0$
 $3y = 2x + 6$