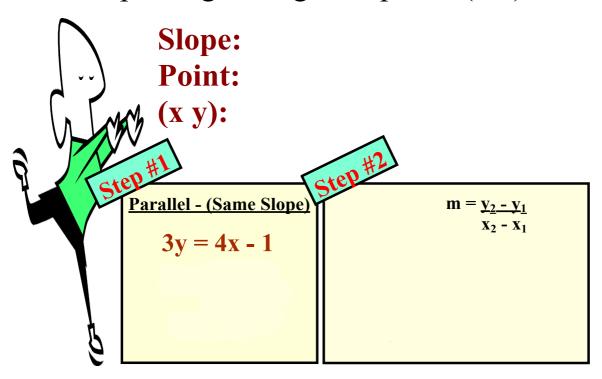Parallel

Perpendicular

$y=mx+b$

Warm Up Questions

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

#2　Determine the equation of a line perpendicular to $4x+5y=7$ and having the same x-intercept as $10x+7y=-20$.

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

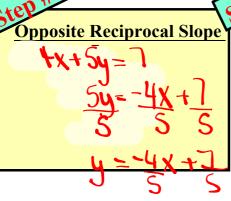Find the equation of a line parallel to 3y=4x-1 and passing through the point (4,2).

Slope:
Point:
(x y):

Step #1

Step #2

Parallel - (Same Slope)

3y = 4x - 1

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

Determine the equation of a line perpendicular to 4x+5y=7 and having the same x-intercept as 10x+7y=-20.

slope: 5/4 $m = 5/4$

point: (-2, 0) $x_1 = -2$ $y_1 = 0$

(x,y):

Step #1

Opposite Reciprocal Slope

$4x + 5y = 7$

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

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

$y = mx + b$

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

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

Step #2

Point   x-int (y = 0)

$10x + 7y = -20$

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

$10x + 0 = -20$

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

$x = -2$

$(-2, 0)$

Step #3

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

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

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

$4 \cdot y = \frac{4 \cdot 5}{4}x + \frac{4 \cdot 10}{4}$ c.d. 4

$4y = 5x + 10$

$0 = 5x - 4y + 10$

Determine the equation of a horizontal line passing through the same point on the y-axis as 3y = 6x - 9 $\;$ (yint ??)

slope: $m = \dfrac{0}{1}$

point: (0, -3) $\qquad x_1 = 0 \qquad y_1 = -3$

$(x_1 y_1): (x_1 y)$

Step #1

Horizontal Line

Slope = 0/1

Step #2

Point $\quad$ y-int $\quad$ (x=0)

$3y = 6x - 9$

$3y = 6(0) - 9$

$3y = 0 - 9$

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

$y = -3$

$(0, -3)$

Step #3

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

$y - {-3} = \dfrac{0}{1}(x - 0)$

$y + 3 = 0(x)$

$\boxed{y + 3 = 0}$

$\boxed{y = -3}$

Homework:

① Given:

point: $(-2, 7)$ $x_1 = -2$ $y_1 = 7$

(i) Find slope

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

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

$$y = mx + b$$

$$m = 4$$

$$m_{\shortparallel} = 4$$

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

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

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

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

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

$$\boxed{y = 4x + 15}$$ Slope intercept form

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

② Given:

$(4,3)$ $x_1 = 4$ $y_1 = 3$

(i) Find slope

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

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

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

$$\boxed{m\perp = -\frac{1}{5}}$$

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

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

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

CD: 5

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

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

③ Given:

x-int: $(3,0)$ $x_1 = 3$ $y_1 = 0$

y-int: $(0,-4)$ or $x_1 = 0$ $y_1 = -4$

(i) Find m: (ii) $y - y_1 = m(x - x_1)$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ $y - {}^-4 = \dfrac{4}{3}(x - 0)$

$m = \dfrac{-4 - 0}{0 - 3}$ $y + 4 = \dfrac{4}{3}(x)$

$m = \dfrac{-4}{3}$ $y + 4 = \dfrac{4x}{3}$

$m = \dfrac{4}{3}$ $\boxed{y = \dfrac{4}{3}x - 4}$

④ Given:

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

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

(I) Find slope.

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

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

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

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

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

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

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

$$0 = 7x - 42 \;{\color{red}-5y + 10}$$

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

$$5y = 7x - 32$$

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

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

$2y - 2 = 10x - 4$

$2y = 10x - 4 + 2$

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

$y = 5x - 1$

$m = 5$

$m_{\parallel} = 5$

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

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

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

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

6) Given

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

horizontal line : $\boxed{m = \dfrac{0}{1}}$

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

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

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

$\boxed{y - 6 = 0}$

① Given:

$(8, -1)$ $x_1 = 8$ $y_1 = -1$

Vertical line : $\boxed{m = \dfrac{1}{0}}$

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

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

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

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

$\boxed{0 = x - 8}$

Examples:

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

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

Slope point form:
$$y = mx + b$$

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

M(3, 5)　U(-2, -1)　D(0, -4)
Find the equation of a line
parallel to MD and passing
through U.

slope:

point:

(x,y):

Equations of Lines - Review

① $x + 2y - 6 = 0$

② $5x + y + 25 = 0$

③ $y = -\dfrac{4}{7}x + \dfrac{1}{7}$

④ $y - 3 = 0$

⑤ $y = 6x + 8$

⑥ $2x - 3y + 6 = 0$

Name: _____

Equations of Lines – Review

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

(i) $4y - 1 = 8x - 5$

$4y = 8x - 4$

$y = 2x - 1$

$m = 2$

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

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

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

$y - 5 = -\frac{1}{2}x - 2$

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

$\boxed{x + 2y - 6 = 0}$

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

(i) $5 - 2y = 10x + 7$

$-2y = 10x + 2$

$y = -5x - 1$

$m = -5$

$m_{||} = -5$

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

$y - 0 = -5(x + 5)$

$y = -5x - 25$

$\boxed{5x + y + 25 = 0}$

3. Determine the equation of a

$m_{11} = -5$

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) $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

$m = \dfrac{-1 - 3}{2 - (-5)}$

$m = \dfrac{-4}{7}$

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

$y + 1 = \dfrac{-4}{7}(x - 2)$

$y + 1 = \dfrac{-4}{7}x + \dfrac{8}{7}$

$y = \dfrac{-4}{7}x + \dfrac{8}{7} - \dfrac{1}{1}$

$\rightarrow y = \dfrac{-4}{7}x + \dfrac{8}{7} - \dfrac{7}{7}$

$\boxed{y = \dfrac{-4}{7}x + \dfrac{1}{7}}$

4. Determine the equation of a **horizontal** line passing through (7, 3).
   Please state your answer in **General Form.** (x_1, y_1)

(i) horizontal line

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

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

$y - 3 = \dfrac{0}{1}(x - 7)$

$\boxed{y - 3 = 0}$

5. Determine the equation of a line with a slope parallel to 4(y – 2) = 24x – 32 and a

(0,8) $\longrightarrow$ y-intercept of 8. Please state your answer in **Slope- Intercept Form.**

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

(ii) $y - y_1 = m(x - x_1)$ $\boxed{y = 6x + 8}$

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

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

(i) $4(y-2)=24x-32$ $y=6x-6$ (ii) $y-y_1=m(x-x_1)$ $\boxed{y=6x+8}$
$4y-8=24x-32$ $m=6$ $y-8=6(x-0)$
$4y=24x-24$ $m_{11}=6$ $y-8=6x-0$

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.** $(-3,0)$ + $(0,2)$

(i) $m=\dfrac{y_2-y_1}{x_2-x_1}$ (ii) $y-y_1=m(x-x_1)$

$m=\dfrac{2-0}{0-(-3)}$ $y-0=\dfrac{2}{3}(x+3)$ $\boxed{2x-3y+6=0}$

● $m=\dfrac{2}{3}$ $y=\dfrac{2}{3}x+\dfrac{6}{3}$

$3y=2x+6$ ●