EMA
Parallel / Perpendicular Lines

Name: key
Date: _____ **Period:** _____

- ***PARALLEL LINES*** have ***SAME*** slopes.

  Given: Linear equation of $y = -3x - 2$.

  Slope of $y = -3x - 2$ is $m = -3$, therefore parallel slope is $m = -3$.

- ***PERPENDICULAR LINES*** have ***OPPOSITE RECIPROCAL (FLIP-FLOP)*** slopes.

  Given: Linear equation of $y = -\frac{1}{4}x + 3$

  Slope of $y = -\frac{1}{4}x + 3$ is $m = \frac{-1}{4}$, therefore perpendicular slope is $m = 4$.

State the parallel and perpendicular slope for each given set of points.

1.) $(-3, 5)$ *and* $(-6, 7)$ (x_1, y_1 and x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7-5}{-6-(-3)} = \frac{2}{-3}$$

Parallel Slope: $m = -\frac{2}{3}$

Perpendicular Slope: $m = \frac{3}{2}$

2.) $(-8, 4)$ *and* $(-6, -4)$ (x_1, y_1 and x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4-4}{-6-(-8)} = \frac{-8}{2} = -4$$

Parallel Slope: $m = -4$

Perpendicular Slope: $m = \frac{1}{4}$

3.) **Write an equation of a line in slope-intercept form that is <u>parallel</u> to the line of $y = \frac{1}{2}x + 6$ and whose y-intercept is -2.**

$y = \frac{1}{2}x + 6$
$\parallel \; m = \frac{1}{2}$
$b = -2$

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

4.) **Write an equation of a line in slope-intercept form that is <u>parallel</u> to the line of $y = -4x - 9$ and passes through the point $(-2, -4)$.**

$y = -4x - 9$
$\parallel \; m = -4$
$(-2, -4)$

$y - y_1 = m(x - x_1)$
$y - (-4) = -4(x - (-2))$
$y + 4 = -4x - 8$

$$y = -4x - 12$$

OR

$y = mx + b$
$-4 = -4(-2) + b$
$-4 = 8 + b$
$-12 = b$

$$y = -4x - 12$$

5.) **Write an equation of a line in slope-intercept form that is <u>parallel</u> to the line $4x - 6y = 12$ and passes through the point $(6, -3)$.**

$4x - 6y = 12$

$-6y = -4x + 12$

$y = \frac{-4}{-6}x + \frac{12}{-6}$

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

$\parallel$ $m = \frac{2}{3}$

$(6, -3)$

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

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

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

$\boxed{y = \frac{2}{3}x - 7}$

or

$y = mx + b$

$-3 = \frac{2}{3}(6) + b$

$-3 = 4 + b$

$-7 = b$

$\boxed{y = \frac{2}{3}x - 7}$

6.) **Write an equation of a line in slope-intercept form that is <u>perpendicular</u> to the line $y - 3 = -2(x + 3)$ and passes through the point $(10, -2)$.**

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

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

$(10, -2)$

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

$y - (-2) = \frac{1}{2}(x - 10)$

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

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

or

$y = mx + b$

$-2 = \frac{1}{2}(10) + b$

$-2 = 5 + b$

$-7 = b$

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

7.) **Write an equation of a line in slope-intercept form that is <u>perpendicular</u> to the line $2x - 3y + 6 = 0$ and passes through the point $(-4, -6)$.**

$2x - 3y + 6 = 0$

$-3y = -2x - 6$

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

$\perp$ $m = -\frac{3}{2}$

$(-4, -6)$

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

$y - (-6) = -\frac{3}{2}(x - (-4))$

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

$\boxed{y = -\frac{3}{2}x - 12}$

or

$y = mx + b$

$-6 = -\frac{3}{2}(-4) + b$

$-6 = 6 + b$

$-12 = b$

$\boxed{y = -\frac{3}{2}x - 12}$

8.) **Write an equation of a line in slope-intercept form that is <u>perpendicular</u> to the line that contains the points $(6, -2)$ *and* $(4, -8)$ and passes through the point $(-9, 4)$.**

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-8 - (-2)}{4 - 6} = \frac{-6}{-2} = 3$

$\perp$ $m = -\frac{1}{3}$

$(-9, 4)$

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

$y - 4 = -\frac{1}{3}(x - (-9))$

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

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

or

$y = mx + b$

$4 = -\frac{1}{3}(-9) + b$

$4 = 3 + b$

$1 = b$

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

Retro Questions

9.) **Simplify.**

$(2x^{-2}yz^{-3})^{-4}$

$= 2^{-4}x^{-2(-4)}y^{-4}z^{-3(-4)}$

$= \frac{1}{2^4} \cdot x^8 \cdot \frac{1}{y^4} \cdot z^{12}$

$= \boxed{\frac{x^8 z^{12}}{16y^4}}$

10.) **Simplify.**

$12 - 16(4^{-2} \cdot 2^5) \div (6 - (-2)) - 8$

$= 12 - 16\left(\frac{1}{16} \cdot 32\right) \div 8 - 8$

$= 12 - 16(2) \div 8 - 8$

$= 12 - 32 \div 8 - 8$

$= 12 - 4 - 8$

$= \boxed{0}$