

### 4.5 Write Equations of Parallel and Perpendicular Lines

Parallel Lines have equal slopes.

Write an equation of the line that passes through the given point and is parallel to the given line.

Ex. 1)  $m = -1$   $x$   $y$   
 $y = -x + 5$ ;  $(-2, 11)$   
 $y - 11 = -1(x + 2)$   
 $y - 11 = -x - 2$   
 $y = -x + 9$

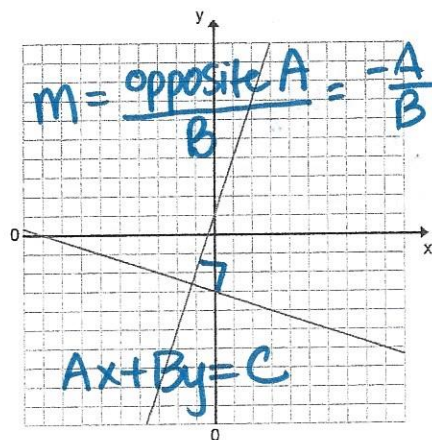
E =  $y = -x + 9$

Ex. 2)  $m = 3$   $x$   $y$   
 $y = 3x - 1$ ;  $(-3, -5)$   
 $y + 5 = 3(x + 3)$   
 $y + 5 = 3x + 9$   
 $y = 3x + 4$

E =  $y = 3x + 4$

Perpendicular Lines: two lines that intersect to form a 90° or right angle.

Perpendicular slopes are opposite reciprocals of one another.



$\frac{1}{2} \rightarrow -2$      $4 \rightarrow -\frac{1}{4}$      $-\frac{6}{7} \rightarrow \frac{7}{6}$

Determine which lines, if any are parallel or perpendicular.

Ex. 3) Line a:  $y = 5x - 3$   $m = 5$

Line b:  $1x + 5y = 2$   $m = -\frac{1}{5}$

Line c:  $-10y - 2x = 0$   $m = \frac{2}{-10} = -\frac{1}{5}$   
 $-2x - 10y = 0$

line b  $\parallel$  line c  
 line a  $\perp$  line b, c

Ex. 4) Line a:  $2x + 6y = -3$

Line b:  $y = 3x - 8$

Line c:  $-1.5y + 4.5x = 6$

$m = -\frac{2}{6} = -\frac{1}{3}$

$m = 3$

$10(4.5x - 1.5y) = (6)10$

$45x - 15y = 60$

$m = \frac{-45}{-15} = 3$

line b  $\parallel$  line c  
 line a  $\perp$  lines b, c

Write an equation of the line that passes through the given point and is perpendicular to the given slope.

$x \ y \quad 2 \rightarrow -\frac{1}{2} \quad m = -\frac{1}{2}$   
Ex. 5)  $(4, -5); y = 4x + 2$

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

$$\begin{array}{r} y + 5 = -\frac{1}{2}x + 2 \\ \underline{-5} \qquad \underline{-5} \end{array}$$

$x \ y \quad 4 \rightarrow -\frac{1}{4} \quad m = -\frac{1}{4}$   
Ex. 6)  $(4, 3); y = 4x + 7$

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

$$\begin{array}{r} y - 3 = -\frac{1}{4}x + 1 \\ \underline{+3} \qquad \underline{+3} \end{array}$$

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

Ex. 7)  $(4, -2), y = 4x + 2$

$$E = \underline{y = -\frac{1}{4}x + 4}$$

$$E = \underline{\hspace{2cm}}$$

Homework: