

W.S. – Writing Equations of Lines Given Various Information

Write an equation in slope-intercept form of each line described.

1. slope = -3 y-intercept = 4

$$y = mx + b$$

$$y = -3x + 4$$

2. slope = 3 passes through (4,1)

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

$$y - 1 = 3(x - 4)$$

$$y - 1 = 3x - 12$$

$$\begin{array}{r} +1 \qquad +1 \\ \hline y = 3x - 11 \end{array}$$

3. slope = -1 passes through (8,5)

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

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

$$y - 5 = -1x + 8$$

$$\begin{array}{r} +5 \qquad +5 \\ \hline y = -x + 13 \end{array}$$

4. slope = $\frac{1}{3}$ passes through (0,0)

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

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

$$y - 0 = \frac{1}{3}x - 0$$

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

5. slope = $-\frac{2}{5}$ passes through (5,7)

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

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

$$y - 7 = -\frac{2}{5}x + \frac{10}{5}$$

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

$$\begin{array}{r} +7 \qquad +7 \\ \hline y = -\frac{2}{5}x + 9 \end{array}$$

- *6. slope = 0 passes through (2,5)

SPECIAL HORIZONTAL LINE

$$y = 5$$

Write the equations of the following lines given 2 points that the line passes through.

7. (x_1, y_1) (8, 1) (x_2, y_2) (1, 8)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 1}{1 - 8} = \frac{7}{-7} = -1$$

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

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

$$y - 1 = -1x + 8$$

$$\begin{array}{r} +1 \qquad +1 \\ \hline y = -x + 9 \end{array}$$

8. (x_1, y_1) (0, -1) (x_2, y_2) (1, 4)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - (-1)}{1 - 0} = \frac{4 + 1}{1} = \frac{5}{1} = 5$$

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

$$y - (-1) = 5(x - 0)$$

$$y + 1 = 5x - 0$$

$$\begin{array}{r} -1 \qquad -1 \\ \hline y = 5x - 1 \end{array}$$

9. x_1, y_1 (-3, 4) (3, -4)

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

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

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

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

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

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

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

11. (2, 5) (-4, 5) SPECIAL HORIZONTAL LINE

$$y = 5$$

10. (-3, -1) (1, -4)

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - (-1)}{1 - (-3)} = \frac{-4 + 1}{1 + 3} = \frac{-3}{4}$$

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

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

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

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

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

$$y = -\frac{3}{4}x - \frac{13}{4}$$

12. (1, 3) (1, 5) SPECIAL VERTICAL LINE

$$x = 1$$

13. Write the equation of the line that passes through (-1, 3) and is parallel to $3x - 4y = 4$.

NEW EQUATION

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

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

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

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

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

SAME SLOPE

REWRITE $y = mx + b$

$$3x - 4y = 4$$

$$-3x \quad -3x$$

$$-4y = -3x + 4$$

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

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

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

14. Write the equation of the line that is perpendicular to $3x - 5y = 7$ and passes through (5, 2).

NEW EQUATION

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

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

$$y - 2 = -\frac{5}{3}x + \frac{25}{3}$$

$$y = -\frac{5}{3}x + \frac{31}{3}$$

$$y = -\frac{5}{3}x + 10\frac{1}{3}$$

REWRITE

$$3x - 5y = 7$$

$$-3x \quad -3x$$

$$-5y = -3x + 7$$

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

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

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

5. Write the equation of the line that passes through $(-4, 5)$ and has the same y-intercept as

$$x + 3y = -9.$$

REWRITE

$$\begin{array}{r} x + 3y = -9 \\ -x \quad -x \\ \hline 3y = -x - 9 \\ \frac{3y}{3} = \frac{-x}{3} - \frac{9}{3} \end{array}$$

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

$$m = \frac{-3 - 5}{0 - (-4)} = \frac{-8}{4} = -2$$

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

$$y - 5 = -2(x - (-4))$$

$$y - 5 = -2(x + 4)$$

$$y - 5 = -2x - 8$$

$$y = -2x - 3$$

NEW EQ

$(0, -3)$ IS THE Y-INTERCEPT.

16. Write the equation of the line that is parallel to $x - 2y = -7$ and contains the point $(-4, 0)$.

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

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

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

$$y = \frac{1}{2}x + \frac{4}{2}$$

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

NEW EQ

REWRITE

$$x - 2y = -7$$

$$\begin{array}{r} x - 2y = -7 \\ -x \quad -x \end{array}$$

$$-2y = -x - 7$$

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

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

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

PARALLEL SLOPE

17. Write the equation of the line that is parallel to $y = -5$ and passes through the point $(7, -3)$.

$$m = 0$$

$$y = -3$$

THE 2 LINES ARE HORIZONTAL. THEREFORE $y = -5$ AND $y = -3$.

18. Write the equation of the line that is perpendicular to $y = \frac{2}{3}x - 9$ and has the same y-intercept as $x - y = 6$.

REWRITE

$$x - y = 6$$

$$\begin{array}{r} x - y = 6 \\ -x \quad -x \end{array}$$

$$-y = -x + 6$$

$$y = x - 6$$

$$y = x - 6$$

$(0, -6)$ POINT

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

PERPENDICULAR SLOPE

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

$$y - (-6) = -\frac{3}{2}(x - 0)$$

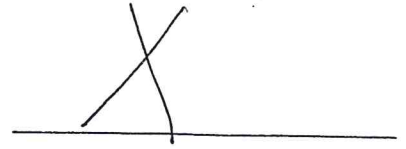
$$y + 6 = -\frac{3}{2}x + 0$$

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

NEW EQ

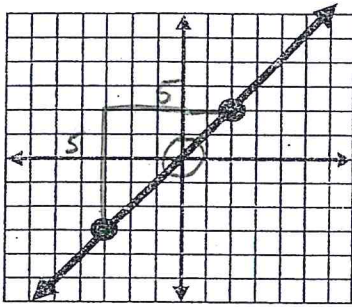
$$y = -\frac{3}{2}x - 6$$

12. Write the equation of a line with an x-intercept of 6 and a y-intercept of 2.



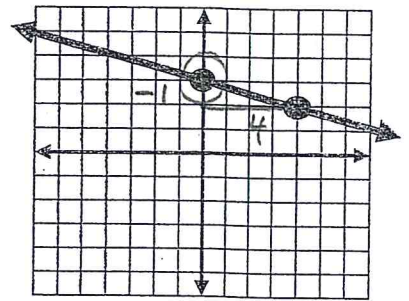
For #13 – 18 use the graph to write the equation of the line in slope-intercept form.

19) 13. $y = 1x + 0$ or $y = x$



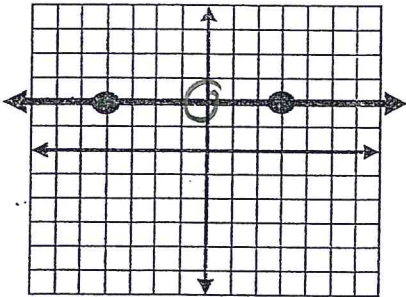
$m = \frac{5}{5} = 1$
 $b = 0$

20) 14. $y = -\frac{1}{4}x + 3$



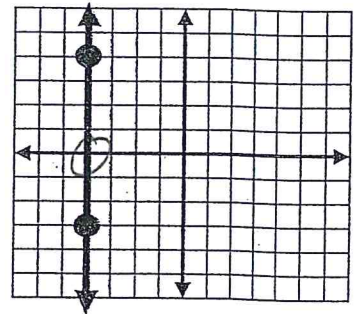
$b = 3$
 $m = -\frac{1}{4}$

21) 15. $y = 2$



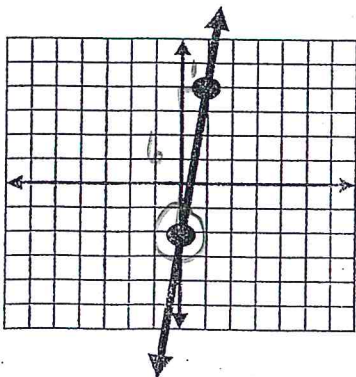
HORIZONTAL
LINE
 $b = 2$

22) 16. $x = -4$



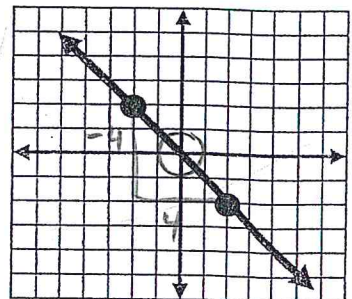
VERTICAL
LINE

23) 17. $y = 6x - 2$



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

24) 18. $y = -1x + 0$ or $y = -x$



$m = -\frac{4}{4} = -1$
 $b = 0$