Master 6e (1)

Day 04: 3-4 Equations of Lines

3-4 Learning Target: Students will be able to write the equation of a line given a graph, the slope and y-intercept, or 2 points. They will also be able to write the equation of a line if it is parallel or perpendicular to a given line. Lastly, they will be able to graph a line in any form.

Point-Slope Form : $y - y_1 = m(x - x_1)$ — MEMORIZE!

m is the slope of the line and (x_1, y_1) are the coordinates of any point on the line.

Slope-Intercept Form: $y = mx + b$ — MEMORIZE!

m is the slope of the line and **b** is the y-intercept

b: the y-intercept is the point on the y-axis where the line crosses or intersects the y-axis, when x = 0.

1. Write an equation in slope-intercept form of the line with the given slope and y-intercept.

a. Slope -2 and y-intercept 4

$y = mx + b$

$y = -2x + 4$ *All you have to do is plug in m and b.* ☺

b. You try: slope 5 and y-intercept 3

$y = 5x + 3$

2. Write an equation in slope intercept form of the line with the given slope that contains the given point.

a. Slope $-\frac{3}{4}$ through (8, 1). $y - y_1 = m(x - x_1)$

$y - 1 = -\frac{3}{4}(x - 8)$

$y - 1 = -\frac{3}{4}x + 6$

$y = -\frac{3}{4}x + 7$

b. You try: slope = $\frac{1}{3}$ through (-6, 5)

$y - 5 = \frac{1}{3}(x - (-6))$

$y - 5 = \frac{1}{3}(x + 6)$

$y - 5 = \frac{1}{3}x + 2$

$\boxed{y = \frac{1}{3}x + 7}$

3. Write an equation in slope-intercept form of the line having the given slope containing the given point.

a. $m = \frac{2}{3}$ and (3,1) $y - y_1 = m(x - x_1)$

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

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

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

b. You try: m = 5 and (2,3)

$y - 3 = 5(x - 2)$

$y - 3 = 5x - 10$

$\boxed{y = 5x - 7}$

4. Write an equation in slope-intercept form of the line going through the given points.

Find the slope first. Then use either point to plug into point slope form.

a. (-2, 4) and (8, 10) $m = \frac{10-4}{8-(-2)} = \frac{6}{10} = \frac{3}{5}$

$y - 4 = \frac{3}{5}(x - (-2))$

$y - 4 = \frac{3}{5}(x + 2)$

$y - 4 = \frac{3}{5}x + \frac{6}{5}$

$y = \frac{3}{5}x + \frac{6}{5} + \frac{20}{5}$ $(+4 = +\frac{20}{5})$

$y = \frac{3}{5}x + \frac{26}{5}$

b. You try: (-3, -7) and (-1, 3)

$m = \frac{3-(-7)}{-1-(-3)} = \frac{10}{2} = 5$

$y - 3 = 5(x - (-1))$

$y - 3 = 5(x + 1)$

$y - 3 = 5x + 5$

$\boxed{y = 5x + 8}$

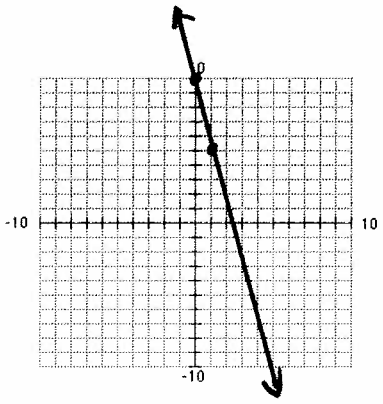
5. Write an equation of the line described below that relates to the line $y = \frac{1}{5}x + 2$. Then graph it.

a. It is perpendicular to the line and contains (2, 0)

If it is perpendicular to $y = \frac{1}{5}x + 2$, then the slope is -5.

$y - 0 = -5(x - 2)$

$y = -5x + 10$



b. You try: It is parallel to the line and contains (1, 4)

All lines have the same slope

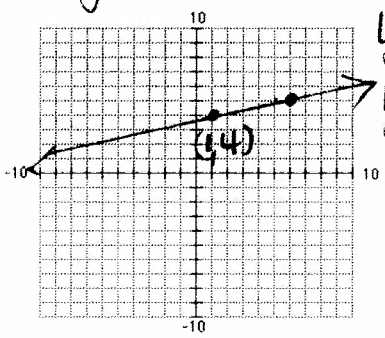
so $m = \frac{1}{5}$

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

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

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

$y = \frac{1}{5}x + \frac{19}{5}$



6. Use the graph to write an equation in slope intercept form for each line shown or described.

a. $\overline{AB}$ $m = \frac{6}{2} = 3$ $b = 4$ $\boxed{y = 3x + 4}$

b. $\overline{CD}$ $m = \frac{4}{2} = -2$ $b = -2$ $\boxed{y = -2x - 2}$

c. $\overline{EM}$ $m = \text{⌀}$ $\boxed{x = 4}$ (vertical line)

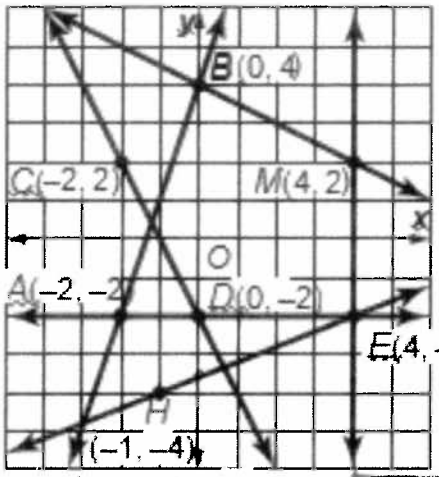
d. $\overline{AE}$ $m = 0$ $\boxed{y = -2}$ (horizontal line)

e. $\overline{EH}$ $m = \frac{2}{5}$ $b = ?$ (4, -2) $y + 2 = \frac{2}{5}(x - 4)$

$y + 2 = \frac{2}{5}x - \frac{8}{5}$

$y = \frac{2}{5}x - \frac{8}{5} - \frac{10}{5} \Rightarrow \boxed{y = \frac{2}{5}x - \frac{18}{5}}$

f. $\overline{BM}$ $m = \frac{-2}{4} = -\frac{1}{2}$ $b = 4$ $\boxed{y = -\frac{1}{2}x + 4}$



g. The line parallel to $\overline{AB}$ and contains (4,2)

$m\overleftrightarrow{AB} = 3$ $\therefore m = 3$

$y - 2 = 3(x - 4)$

$y - 2 = 3x - 12 \Rightarrow \boxed{y = 3x - 10}$

h. The line perpendicular to $\overline{CD}$ and contains (0,3)

$m\overleftrightarrow{CD} = -2$ $\therefore m = \frac{1}{2}$

$y - 3 = \frac{1}{2}(x - 0)$

$y - 3 = \frac{1}{2}x \Rightarrow \boxed{y = \frac{1}{2}x + 3}$