

Writing Equations of Parallel and Perpendicular Lines

Lesson Objective

INBAT write eqns. of $\parallel$ and $\perp$ lines
when given another line

Using Slope-Intercept Form

$$y = mx + b$$

Step 1: Find the slope (m) of the parallel (or perpendicular) lineStep 2: Find the y-intercept (b) by using (m) from Step 1, and the given point (x, y)Step 3: Write the equation of the line using the slope (m) and y-intercept (b) from Steps 1 and 2.

Examples:

1. Write an equation of the line passing through point
- $(-1, 1)$
- that is
- parallel
- to the line
- $y = 2x - 3$
- .

① $\parallel$ slope: $m = 2$

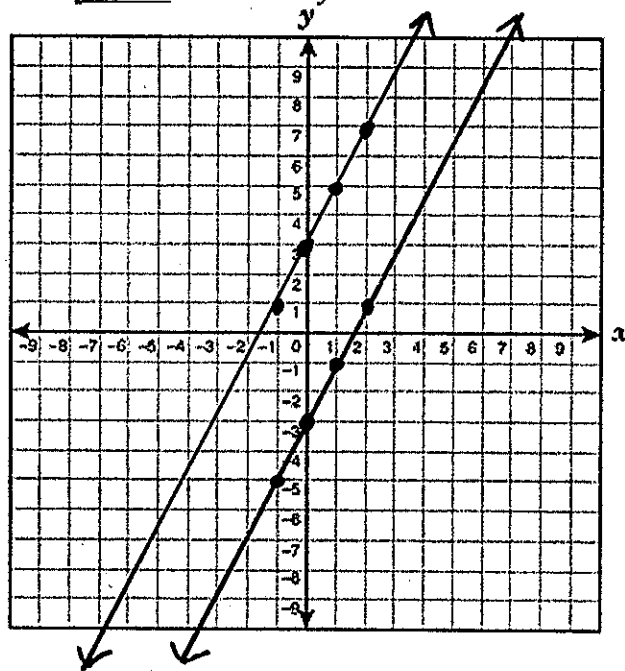
② $y = mx + b$

$$1 = (2)(-1) + b$$

$$1 = -2 + b$$

$$3 = b$$

③ $y = 2x + 3$



2. Write an equation of the line passing through
- $(2, 3)$
- that is
- perpendicular
- to the line
- $2x + y = 2$

① $\perp$ slope: $(-2)(m) = -1$
$$m = \frac{-1}{-2} = \frac{1}{2}$$

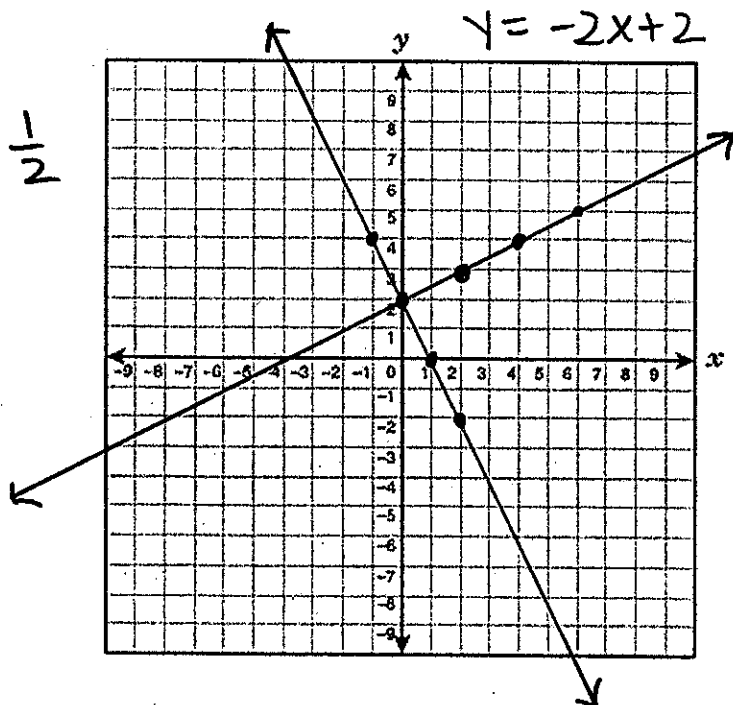
② $y = mx + b$

$$3 = \frac{1}{2}(2) + b$$

$$3 = 1 + b$$

$$2 = b$$

③ $y = \frac{1}{2}x + 2$



Using Point-Slope Form $\rightarrow y - y_1 = m(x - x_1)$

Step 1: Find the slope (m) of the parallel (or perpendicular) line

Step 2: Plug in the slope (m) from above and the given point (x, y) to the point-slope form equation of a line.

Step 3: Solve for y to get the equation into slope-intercept form.

Examples:

3. Write an equation of the line that passes through the point $(1, 5)$ and is parallel to the line $y = 3x - 5$

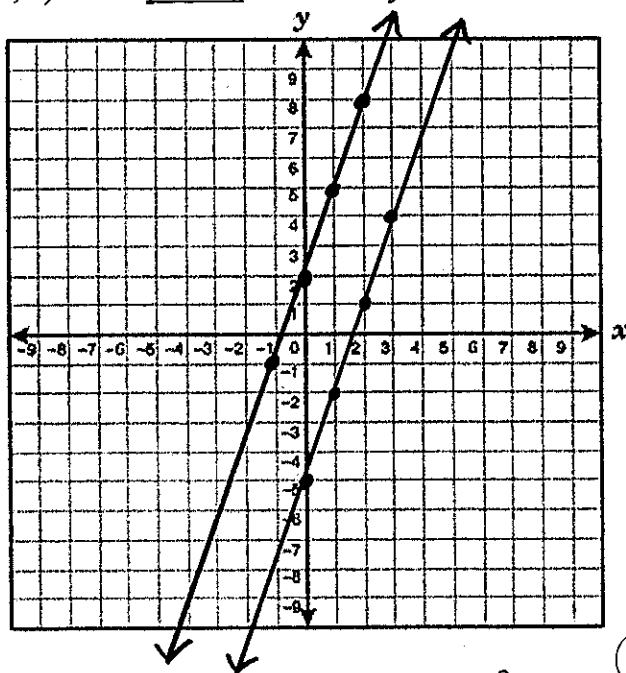
① $\parallel$ slope: $m = 3$

② $y - y_1 = m(x - x_1)$

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

$$y - 5 = 3x - 3$$

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



4. Write an equation of the line passing through the point $(-6, -6)$ that is perpendicular to line $y = -\frac{2}{3}x - 10$

① $\perp$ slope: $(-\frac{2}{3})(m) = -1$

$$-2m = -3$$

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

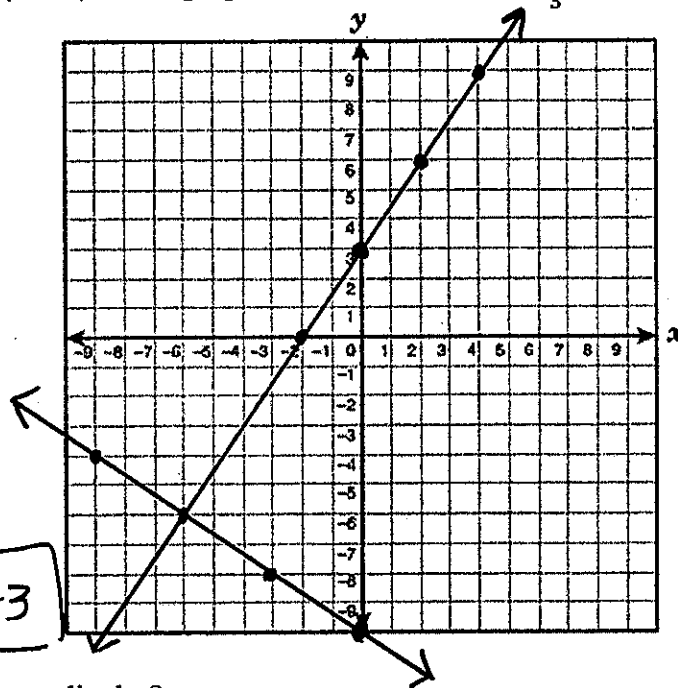
② $y - y_1 = m(x - x_1)$

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

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

$$y + 6 = \frac{3}{2}x + 9$$

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



5. How do you know that the line $x = 4$ and $y = 2$ are perpendicular?

by $\perp$ Lines Thm, vert. lines ($x = 4$) are always $\perp$ to horiz. lines ($y = 2$)