

Section 1.4 Notes

Equations of Lines and Modeling

1 Finding the Equation of Line

Point-Slope Form

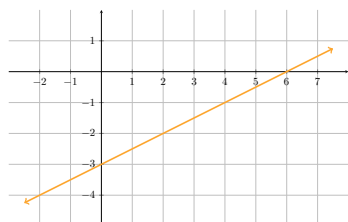
- If you know the slope and any point on a line, you can write the equation in point-slope form:

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

- m is the slope of the line ($\frac{\text{rise}}{\text{run}}$)
- (x_1, y_1) is the point

Examples

1. Determine the slope-intercept form of the equation for the following graph:



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

2. Determine the slope-intercept form of the line which has a slope of -4 and a y -intercept of $(0, \frac{2}{3})$.

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

3. Find the standard form of a line with a slope of $\frac{3}{4}$ and which passes through the point $(-1, 4)$.

$$\begin{aligned} -3x + 4y &= 19 \\ \text{or} \\ 3x - 4y &= -19 \end{aligned}$$

4. Find the slope-intercept form of a line which passes through the points $(-3, 1)$ and $(4, 2)$.

$$y = \frac{1}{7}x + \frac{10}{7}$$

5. Find the formula for the linear function $g(x)$, where $g(2) = 1$ and $g(-1) = 5$.

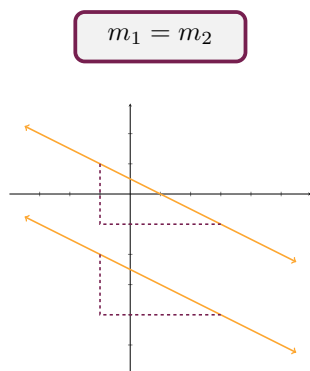
$$g(x) = -\frac{4}{3}x + \frac{11}{3}$$

2 Parallel and Perpendicular Lines

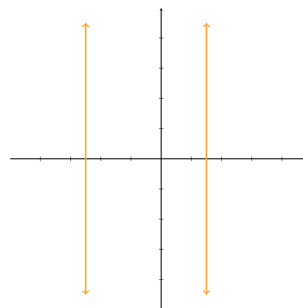
Parallel Lines

Parallel lines are lines which run in the same direction and never cross.

- Two lines with defined slope are parallel when they have the same slope.



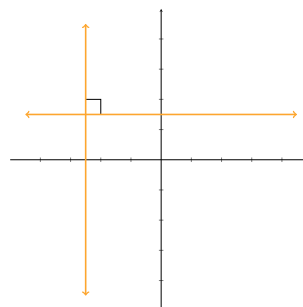
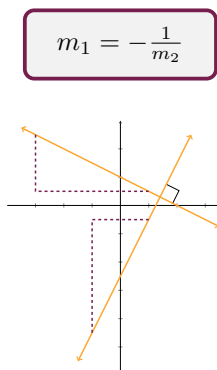
- Two vertical lines (which don't have a slope) are parallel.



Perpendicular Lines

Perpendicular lines are lines which cross at exactly a 90° angle.

- Two lines with defined slope are perpendicular when their slopes are negative reciprocals of each other.
- Vertical lines (which don't have a slope) are perpendicular to horizontal lines.



Examples

- Are the following pairs of lines parallel, perpendicular, or neither?

(a) $y = \frac{26}{3}x - 11$; $y = -\frac{3}{26}x + 15$

Perpendicular

(c) $x = 3$; $y = 6$

Perpendicular

(b) $x + 2y = 5$; $2x + 4y = 17$

Parallel

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

Neither

- Find the equation of the line which is parallel to $2x - y = 6$ which passes through the point $(-1, 3)$.

$y = 2x + 5$

3. Find the equation of the line which is perpendicular to $-3x + 2y = 1$ which passes through the point $(3, 5)$.

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

4. Find a so that the line which passes through $(a, 4)$ and $(-1, 3)$ is parallel to line $y = -3x + 6$.

$$a = -\frac{4}{3}$$