

I. Find the slope of the line that is a) parallel and b) perpendicular to the given line

1a) $5x + 2y = 10$

1b) $y = -7$

1c) $x = 10$

II. Write an equation for the line in point/slope form and slope/intercept form that has the given condition.

2a) passes through $(-7,2)$ and is parallel to $7x + 2y = 0$

2b) passes through $(3,-1)$ and is perpendicular to $y = 2x - 3$

Solution

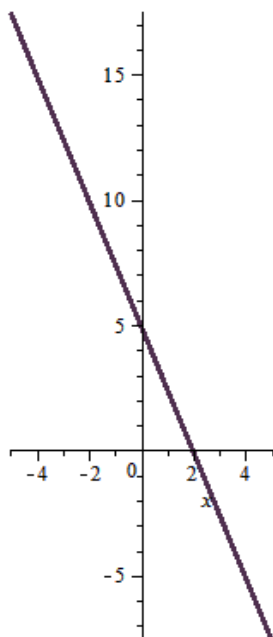
Parallel lines and their slopes $m_1 = m_2$. Since slope is a measure of the angle of a line from the horizontal, and since parallel lines must have the same angle, then parallel lines have the same slope — and lines with the same slope are parallel. Find the slope of the line that is parallel to the given line $5x + 2y = 10$

$$5x + 2y = 10$$

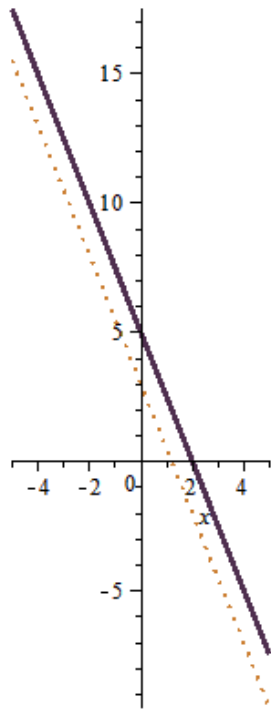
$$2y = 10 - 5x$$

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

$y = -\frac{5}{2}x + 5$ is the formula for a line with as slope of $(-\frac{5}{2})$, the reference slope from the reference line is $m_1 = -\frac{5}{2}$. Any line with a slope of $(-\frac{5}{2})$ is parallel to this line. Graphing equation is as follows:



The slope of the line that parallel to the given line $y = -\frac{5}{2}x + 5$.

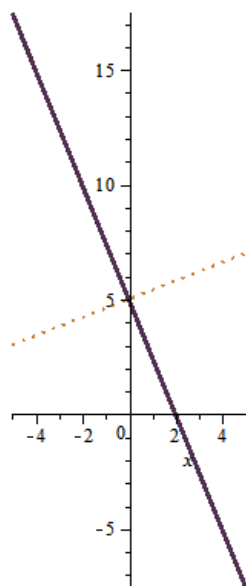


Example of the parallel line equation

Find the slope of the line that perpendicular to the given line $y = -\frac{5}{2}x + 5$. If we visualize a line with positive slope (so it's an increasing line), then the perpendicular line must have negative slope (because it will be a decreasing line). Perpendicular slope have opposite sign. Any line perpendicular to this line has a slope of the negative reciprocal of this slope.

$$m_1 = -\frac{1}{m_2}; m_1 = -\frac{1}{-\frac{5}{2}} = \frac{2}{5}$$

Graphing equations is as follows:



The slope of the line that perpendicular to the given line $y = -\frac{5}{2}x + 5$.

$$1b) y = -7$$

The equation of a line: $y = mx + b$, $y = 0x - 7$, $m = 0$. A parallel line has slope of 0.

The perpendicular has a slope of $-\frac{1}{0}$ which is undefined slope.

$$1c) x = 10$$

A parallel line has an undefined slope; the perpendicular has a slope of 0.

II. Write an equation for the line in point/slope form and slope/intercept form that has the given condition.

2a) passes through $(-7,2)$ and is parallel to $7x + 2y = 0$

Firstly find the slope of the line that is parallel to the given line $7x + 2y = 0$.

$$7x + 2y = 0$$

$$2y = -7x$$

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

The reference slope from the reference line is $m_1 = -\frac{7}{2}$. Since a parallel line has an identical slope, then the parallel line through $(-7,2)$ will have slope $m_1 = -\frac{7}{2}$. Use the point-slope form to find the line:

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

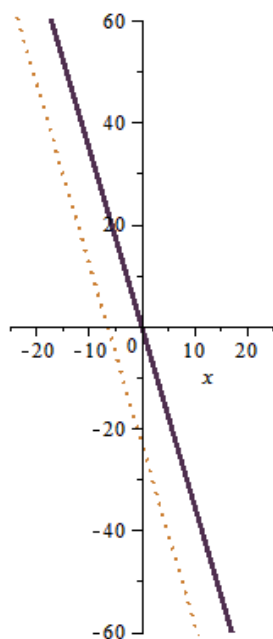
$$y - 2 = -\frac{7}{2}x - \frac{49}{2}$$

$$y = -\frac{7}{2}x - \frac{49}{2} + 2$$

$$y = -\frac{7}{2}x - \frac{45}{2}$$

This is the parallel line that they asked for.

Slope/intercept equation of a line : $y = mx + b$. To find an equation for the line in point substitute the coordinate $(-7,2)$ into $y = -\frac{7}{2}x + b \Rightarrow 2 = -\frac{7}{2}(-7) + b \Rightarrow b = -\frac{45}{2}$. Slope/intercept form is $y = -\frac{7}{2}x - \frac{45}{2}$. Point/slope form is $y - 2 = -\frac{7}{2}(x + 7)$. Graphing equations is as follows:



II. Write an equation for the line in point/slope form and slope/intercept form that has the given condition.

2b) passes through $(3, -1)$ and is perpendicular to $y = 2x - 3$

Find the slope of the line $y = 2x - 3$, the reference slope is $m_1 = 2$, and, for the perpendicular slope, we will this slope and change the sign. Then the perpendicular slope is $m_1 = -\frac{1}{2}$ to our line. So now we can do the point-slope form. Note that the only change from the calculations I just did is that the slope is different now. To find an equation for the line in point substitute the coordinate $(3, -1)$ into $-1 = -\frac{1}{2} \cdot 3 + b \Rightarrow b = -\frac{1}{2}$. Slope/intercept form is $y = -\frac{1}{2}x + \frac{1}{2}$. Point/slope form is $y - (-1) = -\frac{1}{2}(x - 3)$ or $y + 1 = -\frac{1}{2}(x - 3)$. Graphing equations is as follows:

