

**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**

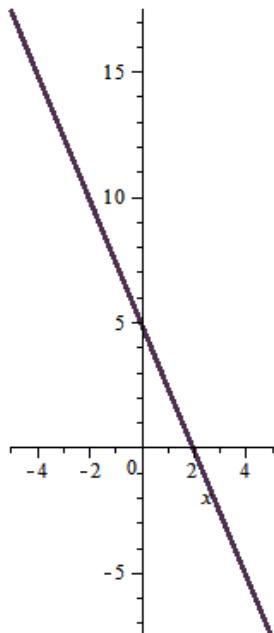
Parallel lines and their slopes  $m_1 = m_2$ . Since slope is a measure of the angle of a line from the horizontal, and since parallel lines must have the same angle, then parallel lines have the same slope — and lines with the same slope are parallel. Find the slope of the line that is parallel to the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

$$5x + 2y = 10$$

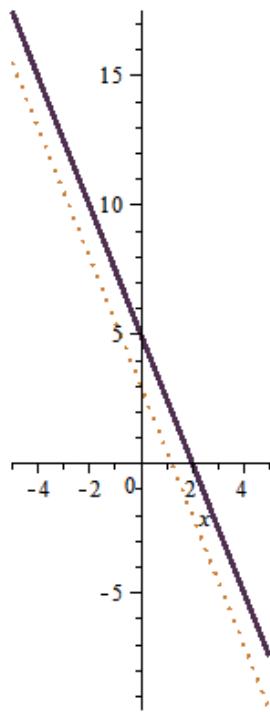
$$2y = 10 - 5x$$

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

$y = -\frac{5}{2}x + 5$  is the formula for a line with a 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 is parallel to the given line  $y = -\frac{5}{2}x + 5$ .

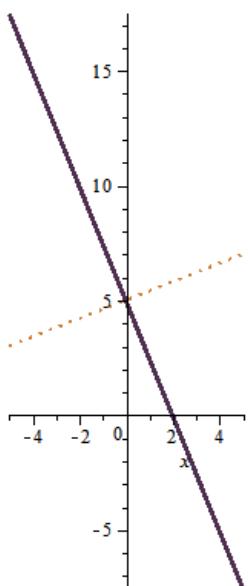


### Example of the parallel line equation

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:

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

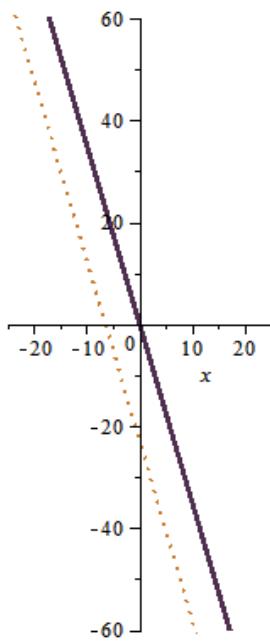
$$y - 2 = -\frac{7}{2}x - \frac{49}{2}$$

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

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

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:

