Find the equation of the line given a point and the equation of a line that is perpendicular to your line.

1. \((4, 6)\); \(\perp\) to \(y = -2x + 19\)

   \[ m_1 = -2 \implies m_2 = -\frac{1}{-2} = \frac{1}{2} \]

   Since my line is perpendicular to \(y = -2x + 19\), so my slope is \(-\left(\frac{1}{2}\right)\):

   \[ y = mx + b \]

   \[ 6 = \left(\frac{1}{2}\right)(4) + b \]

   \[ 6 = 2 + b \]

   \[ 4 = b \]

   \[ \therefore y = \frac{1}{2}x + 4 \]

2. \((-2, -4)\); \(\perp\) to \(6x - 3y = 14\).

To find the slope of the line \(6x - 3y = 14\), we solve for \(y\):

\[ 6x - 3y = 14 \]

\[ -3y = -6x + 14 \]

\[ y = 2x - \frac{14}{3} \]

\[ \therefore m_1 = 2 \implies m_2 = -\frac{1}{2} \]

\[ y = mx + b \text{ plug in point } (-2, -4) \]

\[ -4 = \left(-\frac{1}{2}\right)(-2) + b \]

\[ -4 = 1 + b \]

\[ -5 = b \]

\[ \therefore y = -\frac{1}{2}x - 5 \]
(1) Express the given equation in slope-intercept form.

\[ 5y - 8 = -3(3 - x) \]

\[ 5y - 8 = -9 + 3x \]

\[ 5y = -1 + 3x \]

\[ 5y = 3x - 1 \]

\[ y = \frac{3}{5}x - \frac{1}{5} \]

(2) Consider the following equations.

\[ 4 - (3y + 2x) = 7(x - y) \text{ and } 4y + 2 = 5 + 9x. \]

pt. 1. Express the first equation in slope-intercept form.

\[ 4 - (3y + 2x) = 7(x - y) \]

\[ 4 - 3y - 2x = 7x - 7y \]

\[ -3y - 2x = 7x - 7y - 4 \]

\[ -3y = 9x - 7y - 4 \]

\[ 4y = 9x - 4 \]

\[ y = \frac{9}{4}x - 1 \]
pt. 2 Express the second equation in slope-intercept form.

\[ 4y + 2 = 5 + 9x \]
\[ 4y = 3 + 9x \]
\[ 4y = 9x + 3 \]
\[ y = \frac{9}{4}x + \frac{3}{4} \]

pt. 3 Determine if the two lines are parallel.
Yes. Because they have the same slope.

2) Express the given equation in slope-intercept form.

pt.1 \[ \frac{4x - 2y}{3} = \frac{4x - 3}{6} \]

\[ 6(4x - 2y) = 3(4x - 3) \]
\[ 24x - 12y = 12x - 9 \]
\[ -12y = -12x + 9 \]
\[ y = x + \frac{9}{12} \]
\[ y = x + \frac{3}{4} \]

Pt. 2 Find the equation of the line which passes through the point \((-12, -3)\) and is perpendicular to the given line \(m_1 = 1\) (from \(y = x + \frac{3}{4}\))
Plug in the given point
\[ y = mx + b \text{ with } x = -12, y = -3, m = -1 \]
\[-3 = (-1)(-12) + b.\]
\[-3 = 12 + b\]
\[-15 = b\]
\[ \therefore y = -x - 15 \]

13) Consider the following equations
\[ \frac{7y + 9x}{3} = x + 1 \text{ and } 3x - 6y = 10x + 3. \]

pt. 1. Express the first equation in slope-intercept form.

\[ \frac{7y + 9x}{3} = x + 1 \]
\[ 7y + 9x = 3(x + 1) \]
\[ 7y + 9x = 3x + 3 \]
\[ 7y = -6x + 3 \]
\[ y = -\frac{6}{7}x + \frac{3}{7} \]

pt. 2. Express the second equation in slope-intercept form.

\[ 3x - 6y = 10x + 3 \]
\[ -6y = 7x + 3 \]
\[ y = -\frac{7}{6}x - \frac{1}{2} \]
pt. 3

Are the two lines perpendicular?

No. Because \((-\frac{6}{7})(-\frac{7}{6})\) \(\neq -1\)

Are the two lines parallel?

No, because the slopes are not the same.