Midpoint = \((-3, 5)\)

Endpoint = \((2, -1)\)

Find the other endpoint \((X_M, Y_M) = \left(\frac{X_1 + X_2}{2}, \frac{Y_1 + Y_2}{2}\right)\)

\((-3, 5) = \left(\frac{X + 2}{2}, \frac{Y - 1}{2}\right)\)

\[
\begin{align*}
\frac{X + 2}{2} &= -3 &\frac{Y - 1}{2} &= 5 \\
X + 2 &= -6 &Y - 1 &= 10 \\
X &= -8 &Y &= 11
\end{align*}
\]

SECTION 2.1 HW

29. \((-2, 5)\)
\((1, 3)\)
\((-1, 0)\)

\[a^2 + b^2 = c^2\]
\[(\sqrt{13})^2 + (\sqrt{13})^2 = (\sqrt{26})^2\]

\[13 + 13 = 26\]

\[2\sqrt{13} = 2\sqrt{13}\]

\[A = \frac{1}{2}bh = \frac{1}{2} (\sqrt{13})(\sqrt{13})\]

\[A = \frac{13}{2}\]

\[d = \sqrt{(-2-1)^2 + (5-3)^2}\]

\[= \sqrt{9 + 4}\]

\[= \sqrt{13}\]

\[d = \sqrt{(1-0)^2 + (3-0)^2}\]

\[= \sqrt{1 + 9}\]

\[= \sqrt{10}\]

\[d = \sqrt{(-1-2)^2 + (0-5)^2}\]

\[= \sqrt{1 + 25}\]

\[= \sqrt{26}\]
The distance formula is given by:

\[ d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2} \]

Substituting the given points \((-2, -1)\) and \((3, y)\):

\[ d = \sqrt{(3 - (-2))^2 + (y - (-1))^2} = \sqrt{25 + (y + 1)^2} = 13 \]

Squaring both sides:

\[ 25 + (y + 1)^2 = 169 \]

Solving for \(y + 1\):

\[ (y + 1)^2 = 144 \]

\[ y + 1 = \pm 12 \]

\[ y = -1 \pm 12 \]

So, the possible values for \(y\) are -13 and 11.

Hence, the points are\((3, 11)\) and \((3, -13)\).

For the right triangle, the Pythagorean theorem is used:

\[ 13^2 + 13^2 = x^2 \]

\[ 169 + 169 = x^2 \]

\[ x^2 = 338 \]

\[ x = \sqrt{338} \]

For the square, the diagonal is given by:

\[ 90^2 + 90^2 = D^2 \]

\[ 2(90)^2 = D^2 \]

\[ \sqrt{2(90)^2} = D \]

\[ 90\sqrt{2} = D \]

And the side length is given by:

\[ 127.28 = D \]
SECTION 2.3

WRITING EQUATIONS OF LINES

1) SLOPE
2) POINT

SLOPE: \[ \frac{\text{rise}}{\text{run}} \]

2 points
\((x_1, y_1) \) \((x_2, y_2) \)

\[ m = \frac{y_2 - y_1}{x_2 - x_1} \]

Positive uphill (\( \text{L to R} \))
Negative downhill (\( \text{L to R} \))

Zero
\( m = 0 \)

Undefined slope

Parallel lines: same slope //

Perpendicular lines: opposite reciprocal slopes
\[ \frac{2}{3} \quad \frac{-3}{2} \quad m \cdot m_2 = -1 \]
SET UP FORM
(point slope form)

\[ y - y_1 = m(x - x_1) \]
(traditional)

\[ m = \frac{y - y_1}{x - x_1} \]
(proportion version)

standard
\[ ax + by = c \]
\[ a > 0 (+) \]
\[ a \neq \text{fraction} \]

slope-intercept form
\[ y = mx + b \]
(solve for y)

Vertical lines: \( x = c \)

\[ x = 2 \]

\[ \begin{array}{c|c}
    x & y \\
    \hline
    2 & 0 \\
    2 & 1 \\
    2 & 2 \\
\end{array} \]

Horizontal lines: \( y = c \)

\[ y = 1 \]

\[ \begin{array}{c|c}
    x & y \\
    \hline
    0 & 1 \\
    2 & 1 \\
    100 & 1 \\
\end{array} \]

Graphing:

\[ 3y - 2x = 0 \]

\[ \begin{array}{c|c}
    x & y \\
    \hline
    0 & -3 \\
    2 & 0 \\
\end{array} \]

\[ m = \frac{-3}{-2} = \frac{3}{2} \]

\[ m = \left( \frac{3}{2} \right) \]

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

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

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

\[ y = \frac{3}{2}x + 3 \]
WRITE THE EQUATION OF THE LINE THROUGH (-2, 4) THAT IS PERPENDICULAR TO THE LINE 3x - 4y = 12. WRITE YOUR ANSWER IN BOTH STANDARD AND SLOPE INTERCEPT FORM.

* start with point slope form

POINT: (-2, 4)
SLOPE: \( \frac{-4}{3} \to 3x - 4y = 12 \)
\[-4y = -3x + 12\]
\[y = \frac{\frac{3}{4}x - 3}{4}\]

need: (-2, 4)
\[m = \frac{-4}{3}\]
\[y - y_1 = m(x - x_1)\]
\[y - 4 = \frac{-4}{3}(x + 2)\]

**slope-intercept (solve for y)**

\[y - 4 = \frac{-4}{3}x - \frac{8}{3}\]
\[y = \frac{-4}{3}x - \frac{8}{3} + \frac{12}{3}\]
\[y = \frac{-4}{3}x + \frac{4}{3}\]

standard form:
\[ax + by = c\]
\[4x + 3y = 4\]

traditional (proportion)

\[m = \frac{y-y_1}{x-x_1}\]
\[\frac{-4}{3} = \frac{y-4}{x+2}\]
\[4(x+2) = 3(y-4)\]
\[4x + 8 = -3y + 12\]
\[4x + 3y = 4\]
slope-intercept
\[ \frac{4}{3} = \frac{y-4}{x+2} \]
\[ y = mx + b \]

\[ 3(y-4) = -4(x+2) \]
\[ 3y-12 = -4x-8 \]
\[ 3y = -4x - 8 + 12 \]
\[ 3y = -4x + 4 \]
\[ y = -\frac{4}{3}x + \frac{4}{3} \]

Write the equation of the line through 
(-1, 4) that is perpendicular to the line \( x = 3 \).

Vertical line
(-3, 7)
\( x = -3 \)

\( \perp \) to vertical lines  
\( \perp \) to horizontal lines
\[ (-1, 4) \]
\[ y = 4 \]