**Topics:** $x, y$-plane and coordinate system, quadrants, plotting points, distance formula, graphing an equation, $x$ and $y$ intercepts

**Student Learning Outcomes:**

1. Students will be able to plot points in an $x, y$-plane using a coordinate system.
2. Students will be able to determine the distance between two points on an $x, y$-plane using the distances formula.
3. Students will be able to graph an equation on an $x, y$-plane and determine the $x$ and $y$ intercepts of the equation.

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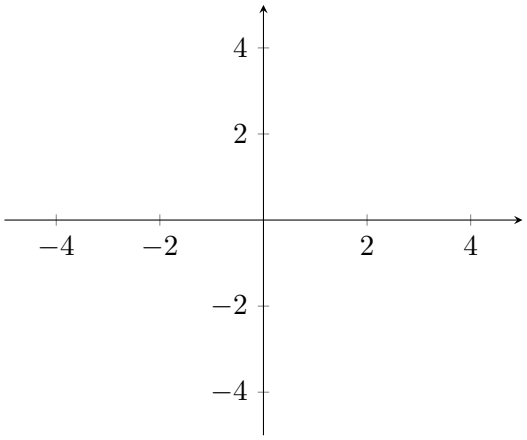
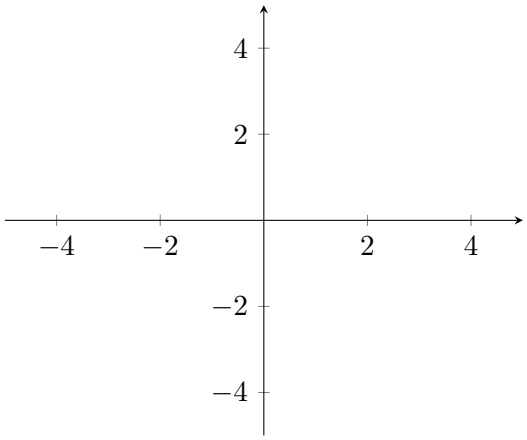
**Rectangular Coordinate System**



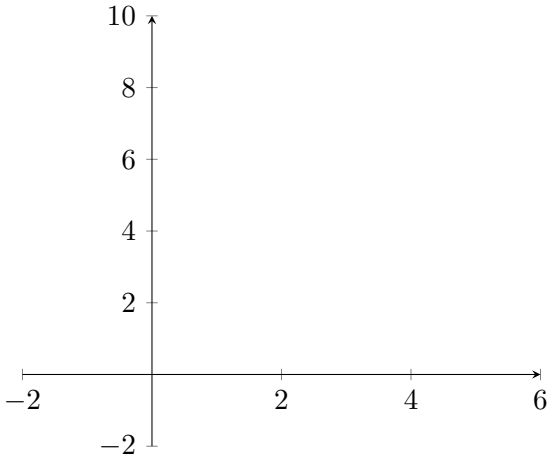

1. Plot and label the given points on the coordinate axes below.

$A(2, -3)$ $B(-2, 0)$ $C(-1, 2)$



**The Distance Formula**

2. Label the points $(1, 5)$ and $(4, 9)$ on the graph below. Then draw a line representing the distance between the points and label that line $d$.




(a) Determine the horizontal distance between the points $(1, 5)$ and $(4, 9)$:
(This is the distance between the $x$-values.)

(b) Determine the vertical distance between the points $(1, 5)$ and $(4, 9)$:
(This is the distance between the $y$-values.)

(c) How can we use these two values to determine the straight-line distance $d$ between the points $(1, 5)$ and $(4, 9)$?

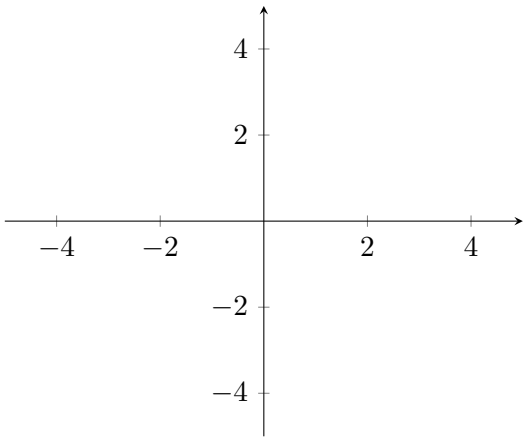
(d) Calculate the distance between the points $(1, 5)$ and $(4, 9)$.

**The Distance Formula:** The distance between points $(x_1, y_1$ and $(x_2, y_2)$ is given by

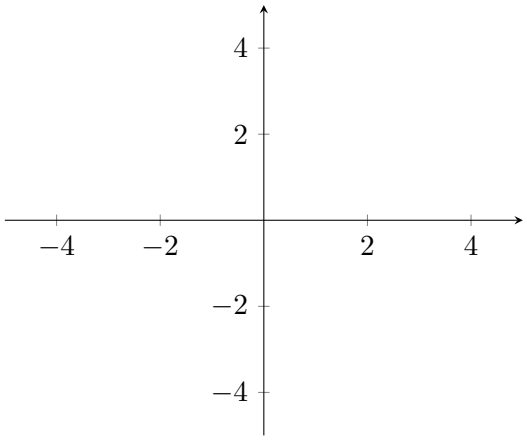
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

**Graph Equations by Plotting Points**

3. Graph the equation $y = x + 2$.




4. Graph the equation $y - |x| = -1$.




**Finding $x$ and $y$ Intercepts**
An $x$-intercept is a point $(x, y)$ where a graph crosses the $x$-axis and a $y$-intercept is a point $(x, y)$ where a graph crosses the $y$-axis.

5. Determine the $x$-intercept(s) and $y$-intercepts of the previous example, $y - |x| = -1$ and label them on the graph.

   (a) $x$-intercept(s):
   $y$-intercept(s):

   (b) What do you notice about the intercepts?

   (c) How are they different?

6. Determine the $x$-intercepts of $y - |x| = -1$ algebraically.

7. Determine the $y$-intercept of $y - |x| = -1$ algebraically.

**Student Learning Outcomes Check**

1. Can you plot points in an $x, y$-plane using a coordinate system?

2. Are you able to determine the distance between two points on an $x, y$-plane using the distances formula?

3. Can you graph an equation on an $x, y$-plane and determine the $x$ and $y$ intercepts of the equation?

**If any of your answers were no, please ask about these topics in class.**