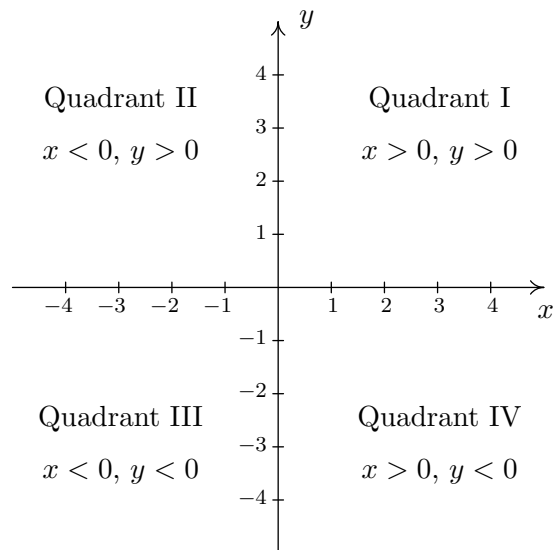

MATH 11010: Introduction to Graphing

Section 1.1

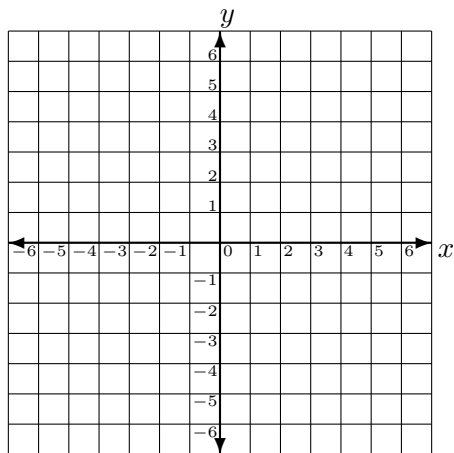
Graphs provide a way of displaying, interpreting, and analyzing data in a visual format. In many problems, we will consider two variables. Therefore, we will need to have two axes – one for the x variable and another for the y variable. Together these axes will form the **Rectangular Coordinate System**, or **Cartesian Coordinate System**. The horizontal axis is the x -axis and the vertical axis is the y -axis. These two axes divide the xy -plane into four **quadrants** and the intersection of the two axes is called the **origin**. See the following diagram.



Ordered pair: Each point in the plane is called an **ordered pair** and is denoted (x, y) . The first number x indicates the point's horizontal location with respect to the y -axis, and the second number y indicates the point's vertical location with respect to the x -axis. Hence, the origin is labeled $(0, 0)$.

Example 1: Plot the following points on the same set of axes:

$$A = (2, -3), \quad B = (-2, 3), \quad C = (-1, -4), \quad \text{and} \quad D = (1, 5).$$



- The ***x*-intercept** of a graph is the point where the graph crosses the *x*-axis. This point is $(a, 0)$ where to find a , we let $y = 0$ and solve for x .
- The ***y*-intercept** of a graph is the point where the graph crosses the *y*-axis. This point is $(0, b)$ where to find b , we let $x = 0$ and solve for y .

Example 2: Find the *x*-intercept(s) and *y*-intercept(s) for $4x^2 + 16y^2 = 5$.

- **The Distance Formula:** The distance d between any two points (x_1, y_1) and (x_2, y_2) is given by

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

- **The Midpoint Formula:** If the endpoints of a segment are (x_1, y_1) and (x_2, y_2) , then the coordinates of the **midpoint** are

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Example 3: Given $(3, -5)$ and $(1, -9)$ find:

(a) the distance between these two points.

(b) the midpoint of the line segment connecting these two points.

- **The Equation of a Circle:** A circle is the set of all points in a plane that are a fixed distance r from a fixed point, the center (h, k) . The equation of a circle with center (h, k) and radius r , in standard form, is

$$(x - h)^2 + (y - k)^2 = r^2$$

Example 4: Find the equation of the circle satisfying the given conditions.

(a) center $(-4, 7)$, radius of length 3.

(b) the points $(4, -3)$ and $(-6, 9)$ are endpoints of the diameter.

Homework: pp 70–72; #1–13 every other odd (eoo), 15–19 odd, 39–65 eoo, 71–89 odd