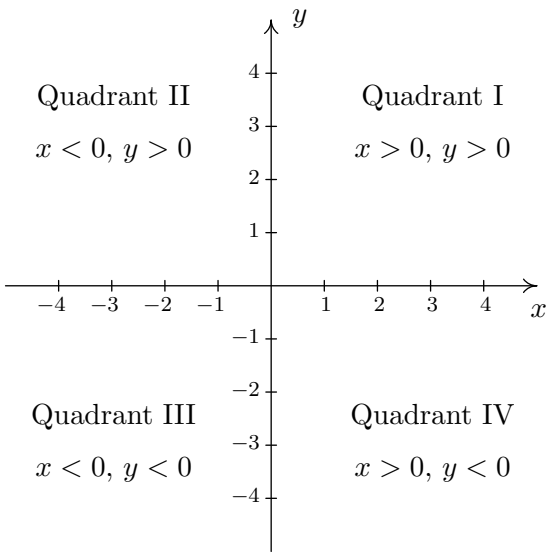
# MATH 11009: Graphs of Functions
# Section 1.2

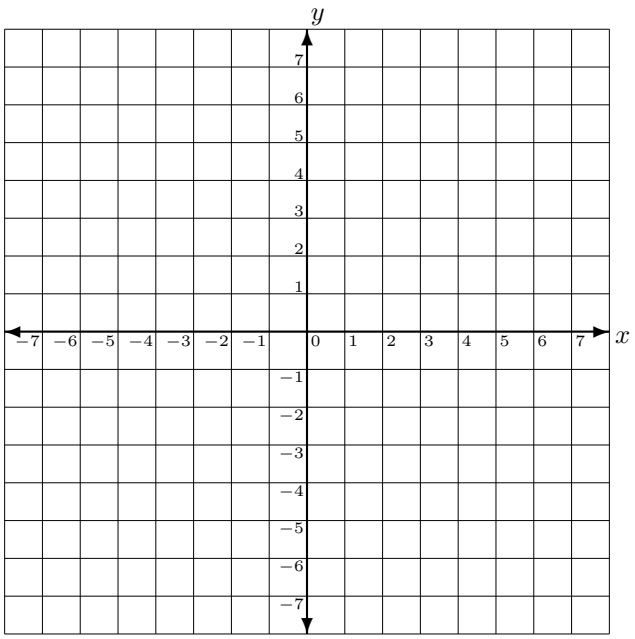
**Graphs** provide a way of displaying, interpreting, and analyzing data in a visual format. In many problems, we will consider two variables. Therefore, we will need to have two axes – one for the $x$ variable and another for the $y$ variable. Together these axes will form the **Rectangular Coordinate 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.



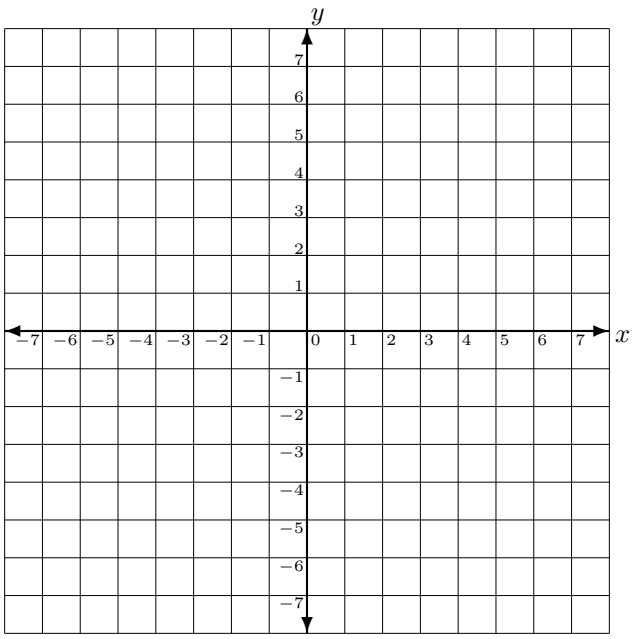

**Ordered pair:** Each point in the plane is called an **ordered pair** and is denoted $(x, y)$. The first number $x$ indicates the point's horizontal location with respect to the $y$-axis, and the second number $y$ indicates the point's vertical location with respect to the $x$-axis. Hence, the origin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

- **Graph:** If $f$ is a function with domain $A$, then the **graph** of $f$ is the set of ordered pairs $(x, f(x))$.
- **Complete Graph:** A graph is a complete graph if it shows the basic shape of the graph and important points on the graph (including points where it crosses $x$ and $y$ axes and points where the graph turns) and suggests what the unseen portions of the graph will be.

**Example 1:** Graph $3x + 2y = 6$ by plotting points.



**Example 2:** Graph $y = (x-3)^2 + 2$ by plotting points.



**Example 3:** The average number of welfare cases in Niagara, Canada, is given by the model

$$y = -112x^2 - 107x + 15,056$$

where $x$ is the number of years after 1990.

(a) Find the value when $x = 8$. Explain what this means.

(b) How many welfare cases were there in 1995, according to this model?