

Cartesian Coordinate System and Linear Equations

MATH 101 *College Algebra*

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Objectives

- ▶ Graph and label ordered pairs of numbers as points on a plane.
- ▶ Find ordered pairs that satisfy a given linear equation.
- ▶ Recognize the standard form of a linear equation.
- ▶ Graph linear equations.
- ▶ Locate the x -intercept and y -intercept of a linear equation.

Cartesian Coordinates

- ▶ An **ordered pair** takes the form (x, y) .
- ▶ x is called the **first coordinate** or just the **x -coordinate**.
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Example

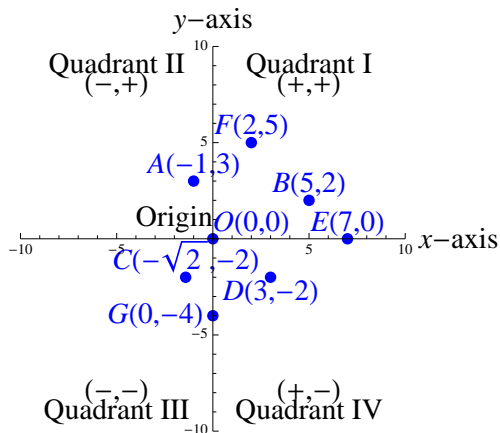
The ordered pair $(2, 7)$ satisfies the equation

$$y = 3x + 1$$

since when $x = 2$ and $y = 7$ then

$$7 = (3)(2) + 1.$$

Cartesian Coordinate System



- ▶ quadrants
- ▶ origin
- ▶ horizontal axis
- ▶ vertical axis

Remark: there is a one-to-one correspondence between points in the plane and ordered pairs of real numbers.

Graphing Straight Lines

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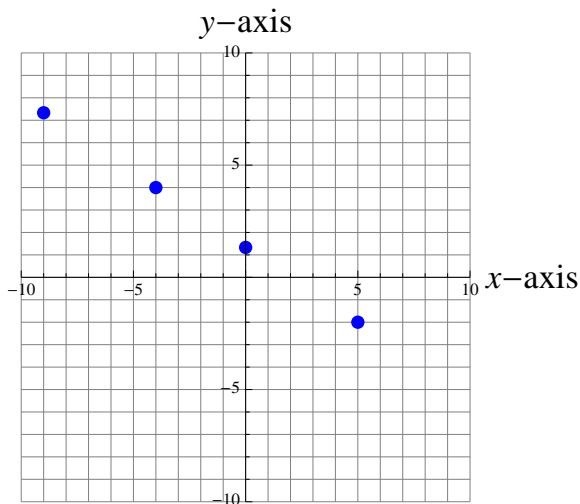
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To find some solutions to a linear equation, we will:

1. choose some arbitrary values for x and substitute them into the equation, and
2. solve for the corresponding value of y .

Graph

Suppose we graph some points which line on the same line.



Remark: every straight line corresponds to some linear equation, and the graph of every linear equation is a straight line.

Graphing Linear Equations

1. Find the coordinates of any two points that satisfy the equation.
2. Plot these two points on a Cartesian coordinate system.
3. Draw a straight line through these two points.
4. Check your work by finding a third point that satisfies the equation and confirm that it lies on the line.

Intercepts

The points on the graph of a line where the line crosses an axis are called its **intercepts**.

- ▶ To find the **y -intercept** (crossing of the y -axis), substitute $x = 0$ and solve for y .
- ▶ To find the **x -intercept** (crossing of the x -axis), substitute $y = 0$ and solve for x .