

# Pre-Calculus

## Lesson 1.1 Points and Lines

### Cartesian Coordinate Graphs

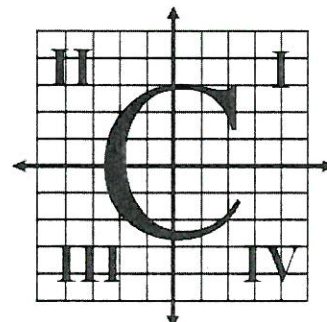
\***Coordinates:** an ordered pair of numbers that gives the location of a point in the coordinate plane

\***x-axis:** horizontal axis

\***y-axis:** vertical axis

\***Origin:** (0, 0), the intersection of the x-axis and y-axis

\***Quadrants:** the four sections of a graph created by the axes



### Linear Equations

\***Solution:** any ordered pair that makes an equation true

\***Linear Equation:** any equation of the form  $Ax + By = C$ , where  $A$  and  $B$  are not both zero

↳ Its graph is a line.

↳ **General Form:**  $Ax + By = C$

↳ **Slope-Intercept Form:**  $y = mx + b$

↳ **Point-Slope Form:**  $y - y_1 = m(x - x_1)$  or  $y = m(x - x_1) + y_1$

### Intersections

| Inconsistent System<br><u>No Solution</u> | Consistent and Independent System<br><u>One Solution</u> | Consistent and Dependent System<br><u>Infinitely Many Solutions</u> |
|---|--|---|
| <u>Parallel Lines</u>                     | <u>Intersecting Lines</u>                                | <u>Same Line</u>  |
|   |  |   |

\***Distance Formula:**  $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

\***Midpoint Formula:**  $M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

# Pre-Calculus

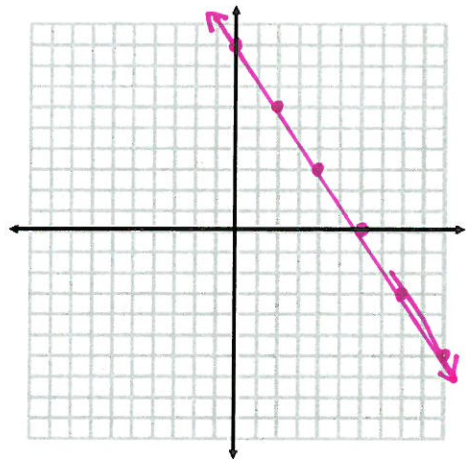
Examples:

1. Sketch the graph of  $3x + 2y = 18$

$$\frac{-3x}{2} = \frac{-3x}{2} + \frac{18}{2}$$

Slope-intercept form:  $y = -\frac{3}{2}x + 9$

↑ slope      ↑ y-int.



2. If  $A = (-1, 9)$  and  $B = (4, -3)$ , find:

- The length of segment AB
- The coordinates of the midpoint of the segment AB

a. Distance formula

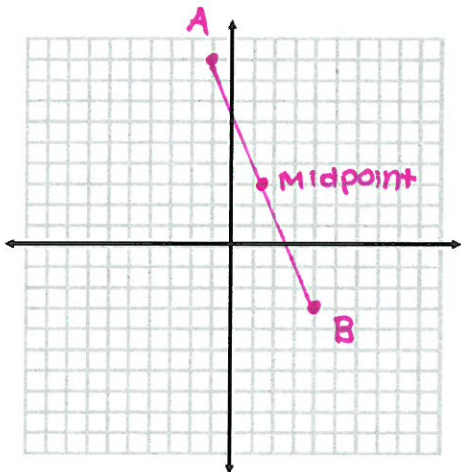
$$\text{length} = \sqrt{(4 - (-1))^2 + (-3 - 9)^2}$$

$$\text{length} = \sqrt{5^2 + (-12)^2} = \sqrt{25 + 144} = \sqrt{169}$$

length = 13 units

b. Midpoint formula

$$\left( \frac{-1+4}{2}, \frac{9+(-3)}{2} \right) = \left( \frac{3}{2}, 3 \right)$$



3. Which of the following points are on the line  $2x + 3y = 15$ ? a, b, d

Plug each in!

- a. (3, 3)      b. (9, -1)      c. (2.5, 3.5)      d. (-10.5, 12)

$2(3) + 3(3) = 15 \checkmark$      $2(9) + 3(-1) = 15 \checkmark$      $2(2.5) + 3(3.5) \neq 15.5 \times$      $2(-10.5) + 3(12) = 15 \checkmark$

4. Solve the given pair of equations simultaneously. Then sketch the graphs of the equations and label the intersection point.

elimination

$$\begin{array}{r} 3x - 5y = 9 \\ -3(x + y = 3) \end{array} \rightarrow \begin{array}{r} 3x - 5y = 9 \\ -3x - 3y = -9 \\ \hline -8y = 0 \\ -8 \quad -8 \\ \hline y = 0 \end{array}$$

$$3x + 5(0) = 9$$

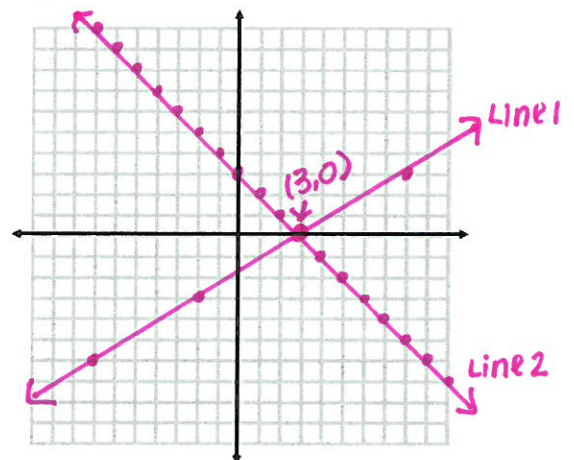
$$\frac{3x}{3} = \frac{9}{3}$$

$$x = 3$$

(3, 0)

$$y = \frac{3}{5}x - \frac{9}{5}$$

$$y = -x + 3$$



Distance formula

5. P is a point on the x-axis 13 units from the point (-3, 5). Find all the possible coordinates for P.

P = (x, 0)

$$13 = \sqrt{(-3-x)^2 + (5-0)^2}$$

$$13^2 = (\sqrt{(-3-x)^2 + 25})^2$$

$$169 = (-3-x)^2 + 25$$

$$\sqrt{144} = \sqrt{(-3-x)^2}$$

$$\pm 12 = -3-x$$

x = 9  
or x = -15

(9, 0) or (-15, 0)