Third method: graphing the equations Two linear equations with two unknowns can also be solved by a graphical method. If the straight lines corresponding to the two equations are plotted in a conventional coordinate system, the intersection of the two lines represents the solution.

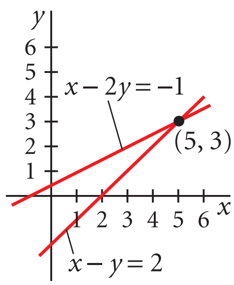

Figure 3

Example

Solve the following two simultaneous equations:

1. $x - y = 2$
2. $x - 2y = -1$

Solution

These two equations are plotted in **Figure 3.** To plot an equation, rewrite the equation in the form $y = ax + b$, where a is the slope and b is the y intercept. In this example, the equations can be rewritten as follows:

$$y = x - 2$$
$$y = \frac{1}{2}x + \frac{1}{2}$$

Once one point of a line is known, any other point on that line can be found with the slope of the line. For example, the slope of the first line is 1, and we know that $(0, -2)$ is a point on this line. If we choose the point $x = 2$, we have $(2, y_2)$. The coordinate y_2 can be found as follows:

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_2 - (-2)}{2 - 0} = 1$$
$$y_2 = 0$$

Connecting the two known coordinates, $(0, -2)$ and $(2, 0)$, results in a graph of the line. The second line can be plotted with the same method.

As shown in **Figure 3,** the intersection of the two lines has the coordinates $x = 5$, $y = 3$. This intersection represents the solution to the equations. You should check this solution using either of the analytical techniques discussed above.

Logarithms

Suppose that a quantity, x, is expressed as a power of another quantity, a.

$$x = a^y$$

The number a is called the *base number.* The *logarithm* of x with respect to the base, a, is equal to the exponent to which a must be raised in order to satisfy the expression $x = a^y$.

$$y = \log_a x$$

Conversely, the *antilogarithm* of y is the number x.

$$x = \text{antilog}_a y$$