Check Solution of a System Equation

Earlier, we learned that the solution of a system equation is the intersection of two lines. In this lesson, we show how to check a solution. First, let's review how to check solution of a linear equation.

Check Solution of a Linear Equation

[**Example 1**] Check whether $x = 3$ is a solution of $-2x + 10 = 4$.

[**Solution**] We plug $x = 3$ into $-2x + 10 = 4$, and we have:

$$\begin{aligned} -2x + 10 &= 4 \\ -2 \cdot 3 + 10 &= 4 \\ -6 + 10 &= 4 \\ 4 &= 4 \end{aligned}$$

The result is true, so $x = 3$ is a solution of $-2x + 10 = 4$.

Next, let's review how to check whether a point is on a line.

Check Whether a Point Is on a Line

[**Example 2**] Check whether the point $(1,-2)$ is on the line $3x - 4y = 10$.

[**Solution**] The point $(1,-2)$ implies $x = 1$ and $y = -2$. We plug in these two numbers into $3x - 4y = 10$, and we have:

$$\begin{aligned} 3x - 4y &= 10 \\ 3 \cdot 1 - 4(-2) &= 10 \\ 3 - (-8) &= 10 \\ 11 &= 10 \end{aligned}$$

The result is false, so the point $(1,-2)$ is not on the line $3x - 4y = 10$.

I hope you can see a connection between Example 1 and Example 2. Basically, we plug values into an equation to check.

Check Solution of a System Equation

[**Example 3**] Is $(1,-2)$ a solution of the system equation $\begin{cases} 3x-4y=11 \\ y=-3x+1 \end{cases}$?

[**Solution**] If $(1,-2)$ is a solution of $\begin{cases} 3x-4y=11 \\ y=-3x+1 \end{cases}$, the point must be the intersection of the lines $3x-4y=11$ and $y=-3x+1$. In other words, $(1,-2)$ must be on both lines.

First, we check whether $(1,-2)$ is on $3x-4y=11$ by plugging $x=1$ and $y=-2$ into $3x-4y=11$:

$$\begin{aligned} &3x-4y=11 \\ &3\cdot 1-4(-2)=11 \\ &3-(-8)=11 \\ &11=11 \end{aligned}$$

The result is true, implying $(1,-2)$ is on the line $3x-4y=11$.

Next, we check whether $(1,-2)$ is on $y=-3x+1$ by plugging $x=1$ and $y=-2$ into $y=-3x+1$:

$$\begin{aligned} &y=-3x+1 \\ &-2=-3\cdot 1+1 \\ &-2=-3+1 \\ &-2=-2 \end{aligned}$$

The result is true, implying $(1,-2)$ is on the line $y=-3x+1$.

Since $(1,-2)$ is on both $3x-4y=11$ and $y=-3x+1$, it is the intersection of both lines, and thus it is the solution of the system equation $\begin{cases} 3x-4y=11 \\ y=-3x+1 \end{cases}$.