

## Checking Equation Solutions on the Calculator

Checking to see if you have the right solution to an equation is a straightforward idea, but has many ways that it can be done on a calculator. Recall that a number is a solution to an equation if the expressions on both sides of the equation evaluate to the same value when the number is substituted into each expression for the variable.

For example, let's say we have an equation in which the left-hand-side is the expression  $2x - 5$  and the right-hand-side is the expression  $x + 1$ . That is, we have the equation

$$2x - 5 = x + 1$$

Let's check by hand to see if  $x = 2$  is a solution. We must substitute  $x = 2$  into each expression, and see if they evaluate to the same number:

### Evaluating the Left-Hand-Side

$2x - 5$  with  $x = 2$  plugged in:

$$2(2) - 5$$

$$4 - 5$$

$$-1$$

### Evaluating the Right-Hand-Side

$x + 1$  with  $x = 2$  plugged in:

$$2 + 1$$

$$3$$

It is often convenient when checking by hand to work both sides of the equation at the same time:

$2x - 5 = x + 1$  with  $x = 2$  plugged in:

$$2(2) - 5 \stackrel{?}{=} 2 + 1$$

$$4 - 5 \stackrel{?}{=} 3$$

$$-1 \stackrel{?}{=} 3$$

We can see that  $x = 2$  is not a solution of  $2x - 5 = x + 1$ , since it doesn't satisfy the equation. That is, it doesn't make the equation true.

There are three main ways to check the solution on the calculator: on the home screen, with a table, and on the graph.

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## On the Home Screen

On the home screen, we must first tell the calculator what value of  $x$  we are checking. To do this, press  $\boxed{2}\boxed{\text{STO}\rightarrow}\boxed{X,T,\Theta,n}\boxed{\text{ENTER}}$ .

Once the calculator has the value of  $x$  stored, we type  $2x - 5$  and press enter, then type  $x + 1$  and press enter. After completing these three steps, the screen should look like:

```
2→X
2X-5      2
          -1
X+1       3
█
```

Just as we saw when we did it by hand, the left-hand-side evaluates to  $-1$ , while the right-hand-side comes out to  $3$ . Since the two sides are not the same, we know  $x = 2$  does not satisfy the equation, and is therefore not a solution.

## With a Table

To use the table to check, press  $\boxed{Y=}$ , then type  $2x - 5$  into  $Y_1$  and  $x + 1$  into  $Y_2$ . Press  $\boxed{2ND}\boxed{\text{TBLSET}}$  and make sure the independent variable is set to ASK. Finally, press  $\boxed{2ND}\boxed{\text{TABLE}}$ , and type 2 and  $\boxed{\text{ENTER}}$ . The screen should look like:

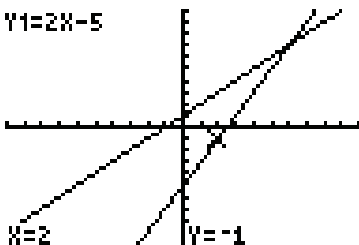
X	Y <sub>1</sub>	Y <sub>2</sub>
2	-1	3
X=		

Once again, we can see that 2 is not a solution.

## On a Graph

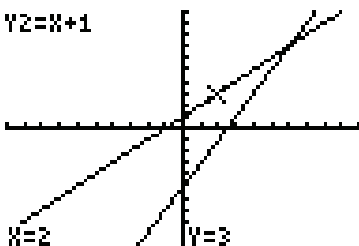
A third way to check your solution is to look at a graph. As we saw in chapter 3, the graph of a line given by  $y = mx + b$  is ordered pairs of numbers in which the first number (the  $x$ ) is substituted into the expression, and the second number (the  $y$ ) is the number that the expression evaluates to.

With our expressions, we have seen that when we substitute  $x = 2$  into  $2x - 5$  we get out  $-1$ . This means that if we graph  $y = 2x - 5$ , the ordered pair  $(2, -1)$  will be on the graph. With your  $\boxed{Y=}$  screen the same as it was for the table check, press  $\boxed{\text{ZOOM}}\boxed{6}$  to see the graph with a standard viewing window. Then press  $\boxed{2\text{ND}}\boxed{\text{CALC}}\boxed{1}$ , and type 2 for  $x$  and press  $\boxed{\text{ENTER}}$ . You should see the following screen:



Notice all the information that we see! The cursor is blinking on the ordered pair  $(2, -1)$ . We can tell that the line that it is on is the line  $y = 2x - 5$  because the equation for the line is in the upper left hand corner of the screen.

To see what the other expression evaluates to, simply press the up arrow on the calculator. This should jump the cursor to the other expression, giving you the following screen:



Looking at these two pictures together, we can see that for  $x = 2$ , the left-hand-side expression evaluates to a lower output ( $y = -1$ ) than the right-hand-expression does ( $y = 3$ ). So, once again we see that  $x = 2$  is not a solution to the equation  $2x - 5 = x + 1$ .