LIVEMATH JumpStart Lesson 3 : Functions

Piecewise Defined Functions : Part Two - In Depth

To add more rows to a piecewise definition, position your cursor at the end of the entree in the second column second row and press **SHIFT-RETURN**.

$$f(x) = \begin{cases} ? & (? < 0) \\ ? & (? \geq 0) \\ ? & ? \end{cases}$$

More **SHIFT-RETURNS** will produce more rows.

When you have a piecewise function defined in three or more pieces than you have change the landscape considerably. With two pieces the defining intervals are both opened ended:

all x's less than 3

all x's greater than or equal to 3

These types of intervals can be described with a single inequality.

$x < 3$

$x \geq 3$

With three intervals the middle interval cannot be of this form. It is not open ended. It stops in both direction. It needs more than one inequality to describe it.

Bounded Intervals

An interval which is not open ended is bounded. It has bounds on both sides. For example the interval betwen 3 and 6 might include one of 3 or 6 or both or neither:

[3, 6] $3 \leq x \leq 6$

[3, 6) $3 \leq x < 6$

(3, 6] $3 < x \leq 6$

(3, 6) $3 < x < 6$

But, for sure it includes no numbers less than 3 and no numbers greater than 6.

Ignoring the endpoints for the moment, this interval can be describe as all numbers which are <u>both</u>

greater than 3

AND

less than 6

AT THE SAME TIME.

Another way to say this is that it is true that these numbers are greater than 3 and it is also true that these numbers are less than 6. This is how the interval will be thought of in LiveMath.

[3, 6] is defined as $(3 \leq x)(x \leq 6)$

[3, 6) is defined as $(3 \leq x)(x < 6)$

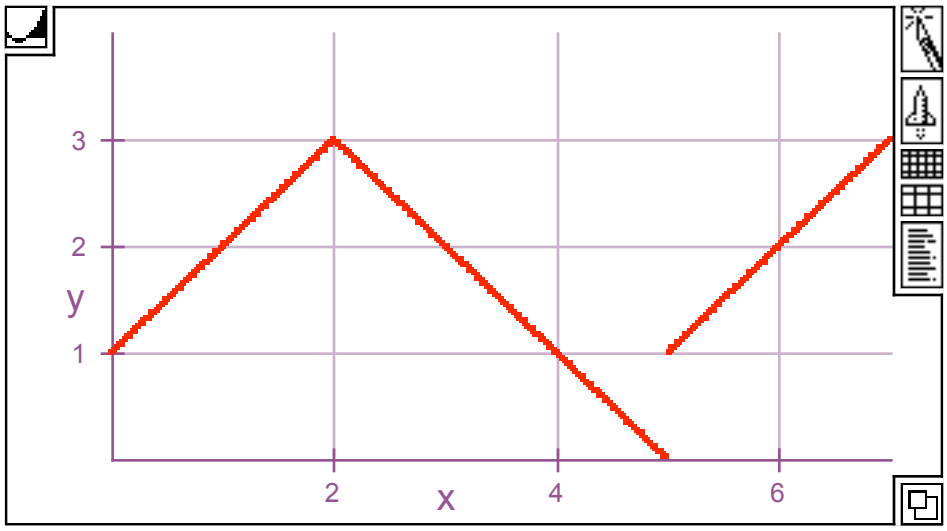
(3, 6] is defined as $(3 < x)(x \leq 6)$

(3, 6) is defined as $(3 < x)(x < 6)$

Take a look at this piecewise defined function and its graph:

$$f(x) = \begin{cases} x + 1 & (x < 2) \\ -x + 5 & (x \geq 2)(x \leq 5) \\ x - 4 & (x > 5) \end{cases}$$

$y = f(x)$



Now It's Your Turn... Follow the directions below to get hands on experience.

1.

Define and graph the function define by

$x^2 + 1$ on the interval (- , 1)
$-x + 3$ on the interval [1, 3]
$\sin(x)$ on the interval (3,)