

Chapter 4 / Example 8

Piecewise functions

Consider the piecewise function

$$h(t) = \begin{cases} \frac{1}{30}t & 0 \leq t \leq 315 \\ 15 - \frac{1}{70}t & t \geq 315 \end{cases}$$

- Sketch the graph of the function.
Suppose that $h(t)$ is modelling the height h (in centimetres) of water in a bathtub as a function of time t (in seconds).
- Give a possible explanation for what happens at $t = 315$.
- Find the number of minutes until the bathtub is empty.
- Hence, write down a practical domain for $h(t)$.

Press $[F1]$ $[Y=]$ to display the equation entry screen.

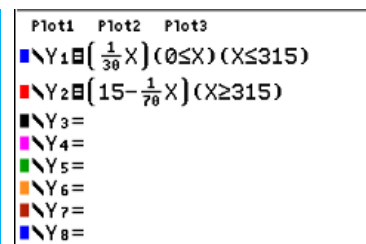
Type $\left(\frac{1}{30}x\right)(0 \leq x)(x \leq 315)$ and press $[ENTER]$ to enter the equation as Y_1 .

Type $\left(15 - \frac{1}{70}x\right)(x \geq 315)$ and press $[ENTER]$ to enter the equation as Y_2 .

To enter \leq press $[2nd]$ $[MATH]$ $[\text{TEST}]$ 6: \leq

To enter \geq press $[2nd]$ $[MATH]$ $[\text{TEST}]$ 4: \geq

Use the fraction template by pressing $[ALPHA]$ $[F1]$ 1: n/d.

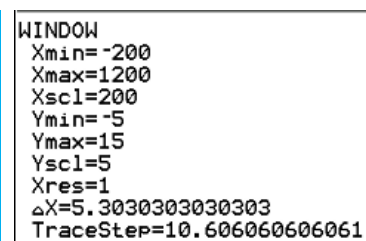


To view the curves in a suitable window press $[F2]$ $[WINDOW]$

Set the axes to show $-200 \leq x \leq 1200$ with a scale of 200 and $-5 \leq y \leq 15$ with a scale of 5.

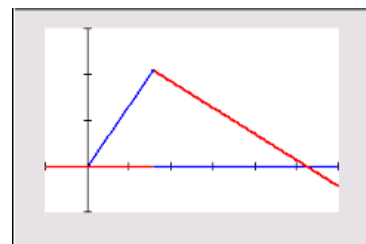
You can leave the other items as they are.

Press $[F5]$ $[GRAPH]$ when you have finished.



The GDC displays the function.

When displaying piecewise functions, the TI84 shows undefined parts of the function as 0.



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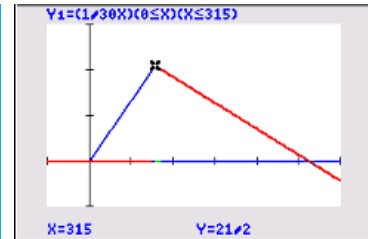
Piecewise functions

The way that piecewise graphs are displayed on the TI-84 Plus C makes them unsuitable for finding the point where they meet using intersection.

To find the value of the function when x is 315 press $\boxed{2\text{nd}} \boxed{[\text{CALC}]}$ 1:value.

Type 315 and press $\boxed{\text{ENTER}}$ to change the x coordinate to 315.

The GDC displays the coordinates of the point $(315, 10.5)$.



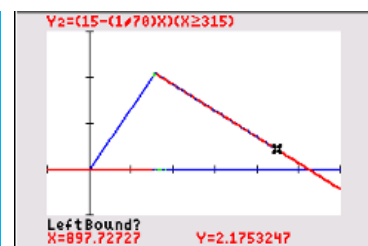
To find the zero press $\boxed{2\text{nd}} \boxed{[\text{F4}]} \boxed{[\text{CALC}]}$ 2:zero

You will need to give the left and right bounds of the region that includes the zero.

Use $\boxed{\nabla}$ to choose Y_2 .

The GDC shows a point on the line and asks you to set the left bound. Move the point using $\boxed{\rightarrow}$ $\boxed{\leftarrow}$ and choose a position to the left of the zero.

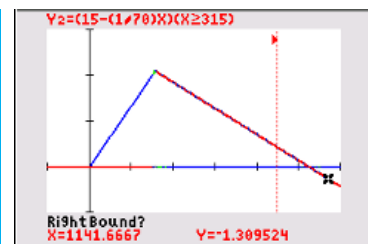
Press $\boxed{\text{ENTER}}$.



The GDC shows a line where you have set the left bound and a point on the curve.

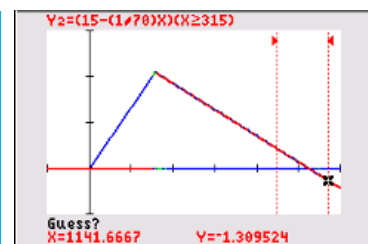
Move the point using $\boxed{\rightarrow}$ $\boxed{\leftarrow}$ and choose a position to the right of the zero.

When the region contains the zero, Press $\boxed{\text{ENTER}}$.



The GDC requires an initial guess for the position of the zero. Choose the default position.

Press $\boxed{\text{ENTER}}$.



The GDC displays a zero at $(1050, 0)$.

The bathtub is empty in 17.5 minutes.

Hence the domain is $0 \leq t \leq 1050$.

