

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 **MENU** 5 **GRAPH** to display the equation entry screen.

Type the function as $\frac{1}{30}x, [0, 315]$ and press **EXE** to enter the function as Y1.

Type the function as $15 - \frac{1}{70}x, [315, 9 \times 10^{99}]$ and press **EXE** to enter the function as Y2.

The intervals in brackets will restrict the functions to the given domains. 9×10^{99} is used in place of ∞ .

Press **□** to add a fraction template and press **x10⁹⁹** to enter the upper limit of the interval.

Graph Func : Y=
Y1= $\frac{1}{30}x, [0, 315]$ [—]
Y2= $15 - \frac{1}{70}x, [315, 9 \times 10^{99}]$
Y3: [—]
Y4: [—]
[SELECT] [DELETE] [TYPE] [TOOL] [MODIFY] [DRAW]

Choose suitable window settings to display the graphs.

Press **SHIFT** **F3** V-WIN.

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.

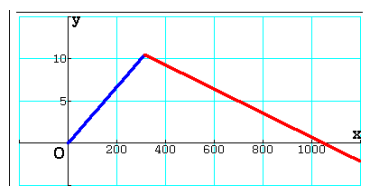
You can leave the other items as they are.

Press **EXIT** when you have finished.

View Window
Xmin : -200
max : 1200
scale : 200
dot : 3.7037037
Ymin : -5
max : 15
[INITIAL] [TRIG] [STANDARD] [V-MEM] [SQUARE]

Press **F6** DRAW to display the graph screen.

The GDC displays the piecewise function.



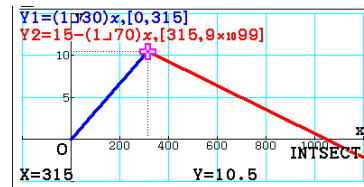
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To find the point where the pieces connect press **F5** G-SOLVE and then press **F5** INTERSECT.

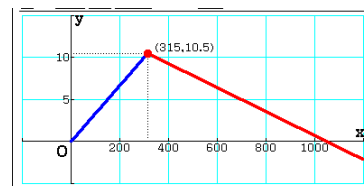
The GDC shows the intersection.

Press **EXE** to display its coordinates.



Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.

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

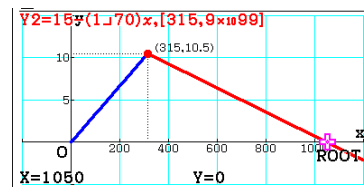


To find the zero, press **F5** G-SOLVE and then press **F1** ROOT.

Select Y2 using ∇ and press **EXE**.

The GDC shows the zero.

Press **EXE** to display the coordinates.



Press **EXIT** to leave G-Solv mode and **F6** DRAW to display the graph screen again.

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

The bathtub is empty in 17.5 minutes.

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

