Piecewise Functions

Definition An overall function defined by different equations for different intervals of x.

Beware of open/closed points at boundaries.

Example 1:
Muffins the Penguin has started a business where he rents out graphing calculators. He charges a flat rate of 5€ for the first hour, then 7€ for above 1h up to 3 hours and then a flat rate of 8€ plus 2€ for each hour after 3 hours

Graph this function, and describe it using an equation.

@ $t=0$, $\in=0$

1st hour, $c=5$ €

1-3 hrs, $c=7$ €

after 3 hrs, $c=8+2t$

* $m=2$ and passes through $(3,8)$

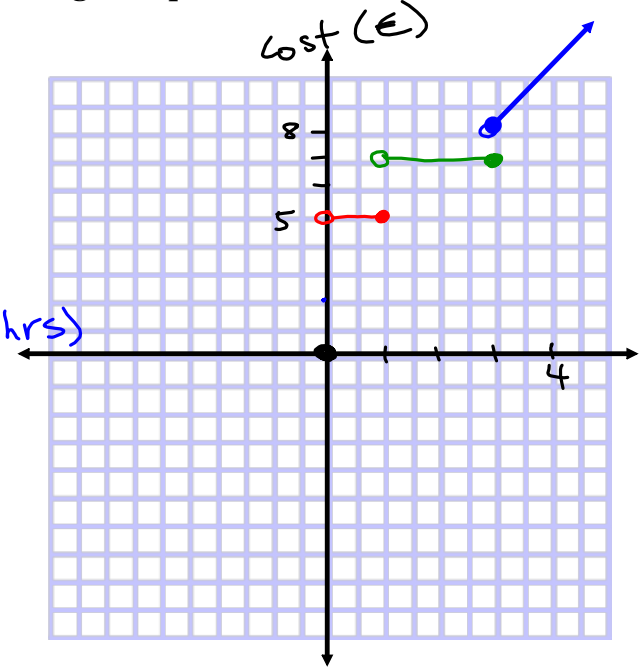
$y=mx+b$

$8=2(3)+b$

$8-6=b$

$b=2$

$\boxed{y=2x+2}$



$$c(t)=\begin{cases} 0, & t=0 \\ 5, & 0<t\leq 1 \\ 7, & 1<t\leq 3 \\ 2x+2, & t>3 \end{cases}$$

Graphing a Piecewise Function

To graph, consider each part of the function on its interval of x... may require multiple TOVs

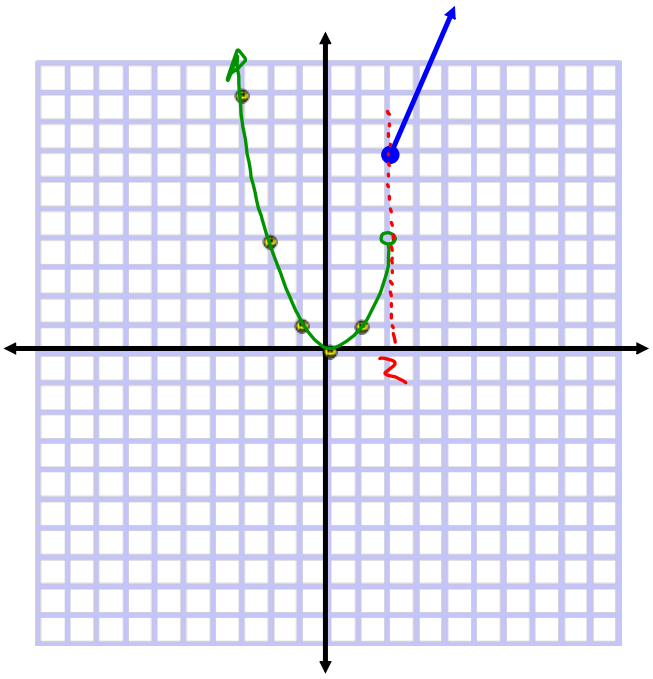
Example 2

$$f(x)=\begin{cases} x^2, & x<2 \\ 2x+3, & x\geq 2 \end{cases}$$

x	y
2	4

x	y
2	7
3	9
4	11

not continuous @ $x=2$



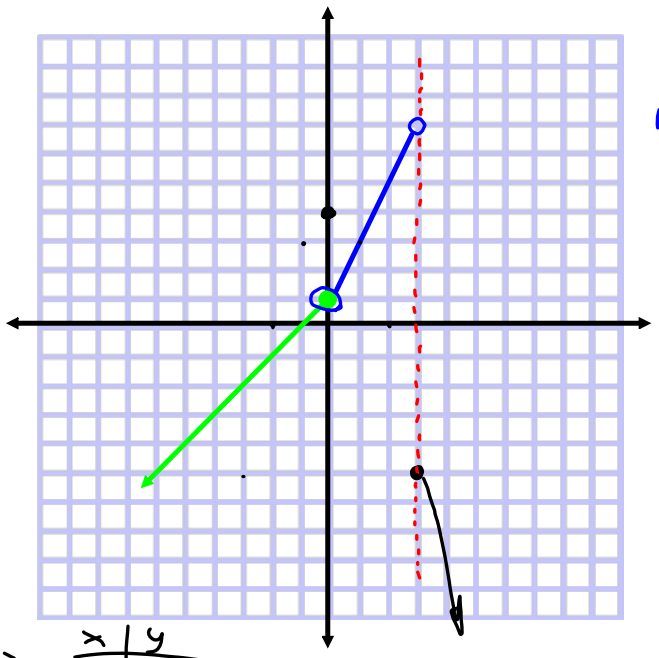
Testing for continuity

check to make sure the function has the same y-values on the left & right of a boundary

If identical → continuous

Example 3: Test if the function g(x) is continuous

$$g(x) = \begin{cases} x+1, & x \le 0 \\ 2x+1, & 0 < x < 3 \\ 4 - x^2, & x \ge 3 \end{cases}$$



$y = x$

x	y
0	0
1	1
2	4
3	9
4	16

left (right boundary)

$y = x + 1$

$y = (0) + 1$

$y = 1$

continuous here!

middle (left): $x = 0$

$y = 2(0) + 1$

$y = 1$

middle (right): $x = 3$

$y = 2(3) + 1$

$y = 7$

right (left): $x = 3$

$y = 4 - (3)^2$

$= 4 - 9$

$y = -5$

discontinuous Boo!

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