Piecewise Function

→Is a function made up of two or more functions, each defined within a specific interval of the domain.

Example:

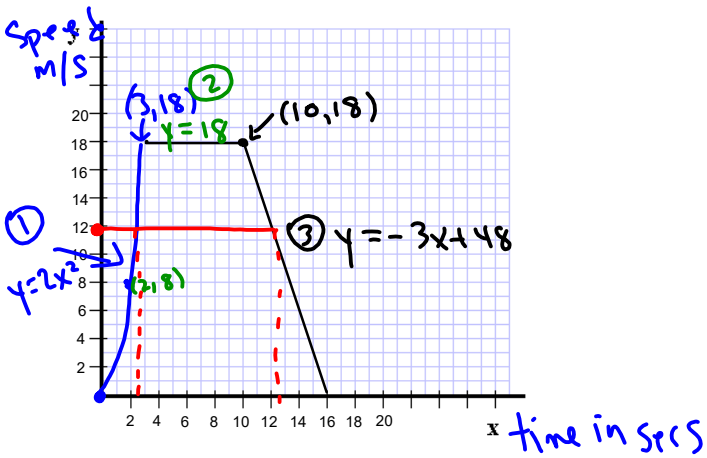
A car's speed between two stops is defined by the following function in which f(x) is the speed, in m/sec, and x is the time in seconds.

$$f(x) = \begin{cases} 2x^2 & \text{if } 0 \le x \le 3 \\ 18 & \text{if } 3 < x < 10 \\ -3x+48 & \text{if } x \ge 10 \end{cases}$$

→ OR $x \in [0,3]$

→ $]3,10[$

→ $[10,+\infty[$



a) At what time(s) was the car moving at 12 m/sec? It hits the function in 2 places.

f(x) or y

1) $f(x)=2x^2$

$\frac{12}{2} = \frac{2x^2}{2}$

$6 = x^2$

$\sqrt{6} = x$

$x = 2.5$ secs

2) $f(x) = -3x+48$

$12 = -3x + 48$

$\frac{-36}{-3} = \frac{-3x}{-3}$

$x = 12$ secs

PIECEWISE FUNCTION

- A function that is made up of several functions over specific intervals of the domain
- The rule will change depending on the interval for which it is defined
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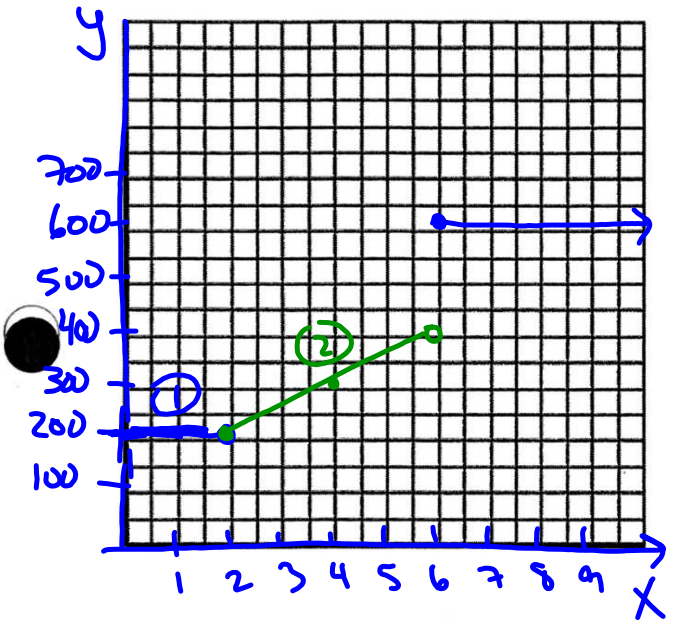
Ex 1: Graph the following piecewise function

$$f(x) = \begin{cases} 200 & \text{if } x < 2 \leftarrow ① \\ 50x + 100 & \text{if } 2 \le x < 6 \leftarrow ② \\ 600 & \text{if } x \ge 6 \leftarrow ③ \end{cases}$$

① $f(x) = 200$

x	y
0	200
1	200
2	200



② $f(x) = 50x + 100$ $\quad 2 \le x < 6$

x	y
2	200
4	300
6	400

③ $f(x) = 600$ $\quad x \ge 6$

x	y
6	600
7	600
8	600

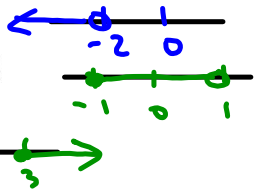
EVALUATING PIECEWISE FUNCTIONS

STEPS:

1. Choose the right function
2. Replace x in your function and calculate

Ex 1: Consider the piecewise function

$$f(x) = \begin{cases} 1 & \text{if } x < -2 \\ 2x - 1 & \text{if } -1 \le x < 1 \\ 2x - 5 & \text{if } x \ge 3 \end{cases}$$



a) Find f(0) = $x = 0$, $y = ?$ $f(0) = 2(0) - 1 = -1$

The answer is in the 2nd branch

b) Find f(4) = $x = 4$, $y = ?$ $f(4) = 2(4) - 5$
$= 3$

In the 3rd branch.

c) Find f(-3) = $x = -3$ $f(-3) = 1$
$y = ?$
1st branch.

d) Find f(-1) = $f(-1) = 2(-1) - 1$
$= -3$

Piecewise Function Review

1. Evaluate the following Piecewise functions given their rules

a)

$$f(x)=\begin{cases} x-1 & \text{if} \quad x\le -2 \\ 2x-1 & \text{if} \quad -2<x\le 4 \\ -3x+8 & \text{if} \quad x>4 \end{cases}$$

$f(-1)=$ -3 $f(-4)=$ -5 $f(5)=$ -7

b)

$$f(x)=\begin{cases} 5 & \text{if} \quad x<-2 \\ \frac{1}{2}x-6 & \text{if} \quad -2\le x\le 6 \\ -2x+10 & \text{if} \quad x>6 \end{cases}$$

$f(-4)=$ 5 $f(8)=$ -6 $f(-2)=$ -7

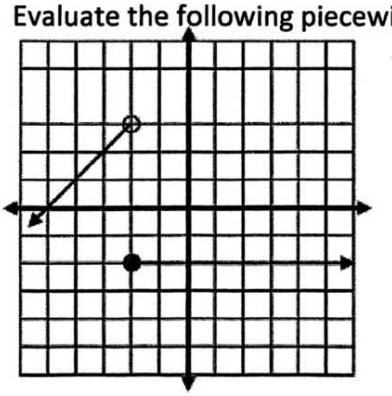
c)

$$f(x)=\begin{cases} 3x-5, & x>4 \\ x^2, & x\le 4 \end{cases}$$

f(7) = 16 f(4) = 16 f(-3) = 9

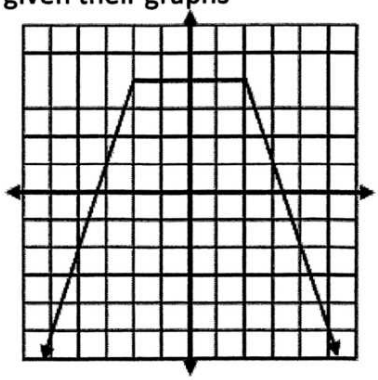
2. Evaluate the following piecewise functions given their graphs

a)



f(-4) = 1
f(-2) = -2
f(3) = -2

b)



f(-4) = -2
f(0) = 4
f(2) = 4