Piecewise Functions

(2 or more functions on same graph)

Piecewise function:

is a function made up of two or more functions, each defined within a specific interval of the domain (ie x-value).

Ex. 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 secs.

$$f(x) = \begin{cases} ① \ 2x^2 & 0 \le x \le 3 \quad [0,3] \\ ② \ 18 & 3 < x < 10 \quad]3,10[\\ ③ \ -3x+48 & x \ge 10 \quad [10,+\infty[\end{cases}$$

$y = 2x^2$

x	y
0	0
1	2
3	18

$2(1)^2$

$2(3)^2$

$y = -3x + 48$

x	y
16	0
10	18

$0 = -3x + 48$

$-48 \qquad -48$

$-48 = -3x \Rightarrow x = 16$
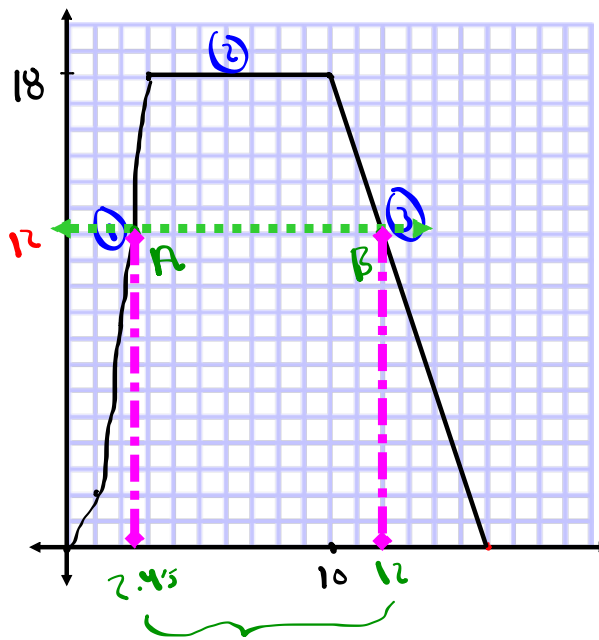
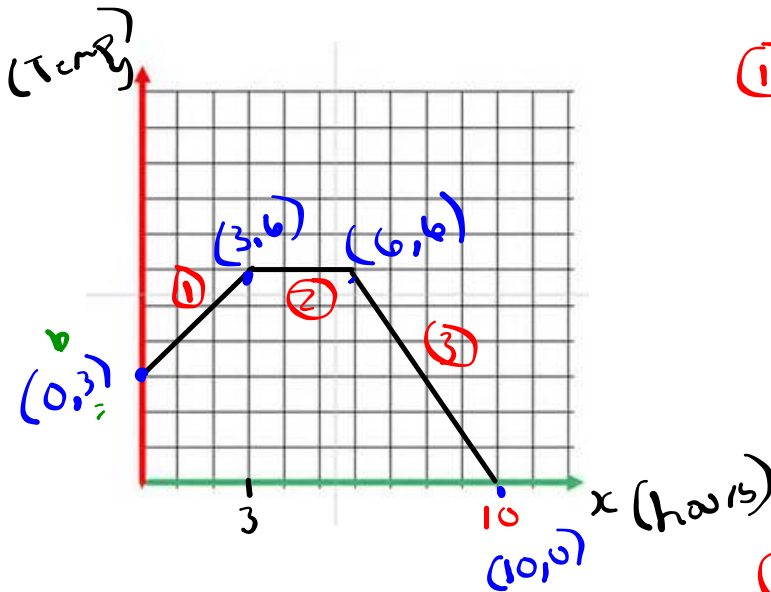At what **times** was the car moving at 12 m/s?

A: $y = 2x^2$

$12 = 2x^2$

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

$\sqrt{6} = \sqrt{x^2}$

$x = 2.45$

B: $y = -3x + 48$

$12 = -3x + 48$

$12 = x$

$d(A,B) = 12 - 2.45 = 9.55 \text{ sec}$

Ex. The temperature outdoors is tracked over the course of 10 hours. Describe the function over:

1) the first 3 hours?   2) between 3 and 6 hours   3) between 6-10 hours

(Temp)

(3,6)   (6,6)

①   ②

③

(0,3)

3

10

(10,0)

x (hours)

① $y = ax + b$

$(0,3)$ $(3,6)$
x_1, y_1 x_2, y_2

$a = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{6-3}{3-0} = \dfrac{3}{3} = 1$

$y = x + 3$

② $y = 6$

③ $y = -1.5x + 15$

$$f(x) = \begin{cases} x+3 & [0,3] \\ 6 & \,]3,6[\\ -1.5x+15 & [6,10] \end{cases}$$