

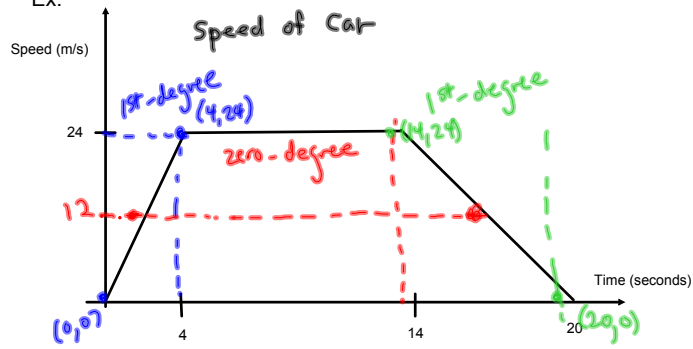
Piecewise Functions

Goal:

- to interpret the graph of a piecewise function
- to use the rule of a piecewise function to solve problems

Piecewise functions are used to model situations that involve more than one function.

Ex:



The rule for this function is written as:

$$f(x) = \begin{cases} 6x, & 0 \leq x < 4 \\ 24, & 4 \leq x < 14 \\ -4x + 80, & 14 \leq x \leq 20 \end{cases}$$

or

$$y = \begin{cases} 6x, & 0 \leq x < 4 \\ 24, & 4 \leq x < 14 \\ -4x + 80, & 14 \leq x \leq 20 \end{cases}$$

After 6 seconds what is the speed?

read graph 24 m/s

After 18 seconds what is the speed?

$x=18$ use 3rd piece

$$\begin{aligned} & -4x + 80 \\ & -4(18) + 80 \\ & = -72 + 80 \\ & = 8 \end{aligned}$$

8 m/s

$y=12$ use 1st piece and 3rd piece
When is the speed 12 m/s?

1st: $y = 6x$
 $12 = 6x$ After 2 sec.
 $2 = x$

3rd: $y = -4x + 80$
 $12 = -4x + 80$
 $-68 = -4x$
 $17 = x$ 17 sec.

Ex:

$$f(x) = \begin{cases} 2x^2, & \text{for } 0 \leq x \leq 3 \\ -2x + 24, & \text{for } 3 \leq x \leq 5 \\ 14, & \text{for } x \geq 5 \end{cases}$$

a) determine $f(1)$.

$$\begin{aligned} f(1) &= 2(1)^2 \\ &= 2(1) \\ &= 2 \end{aligned}$$

b) determine $f(5)$

$$f(5) = 14$$

c) determine $f(x) = 8$ means $y = 8$ $x = ?$

Try 1st piece:

$$8 = 2x^2$$

$$4 = x^2$$

$$\sqrt{4} = x$$

$$x = 2 \checkmark \text{ this is } \underline{\text{in}} \text{ 1st piece}$$

Try 2nd piece

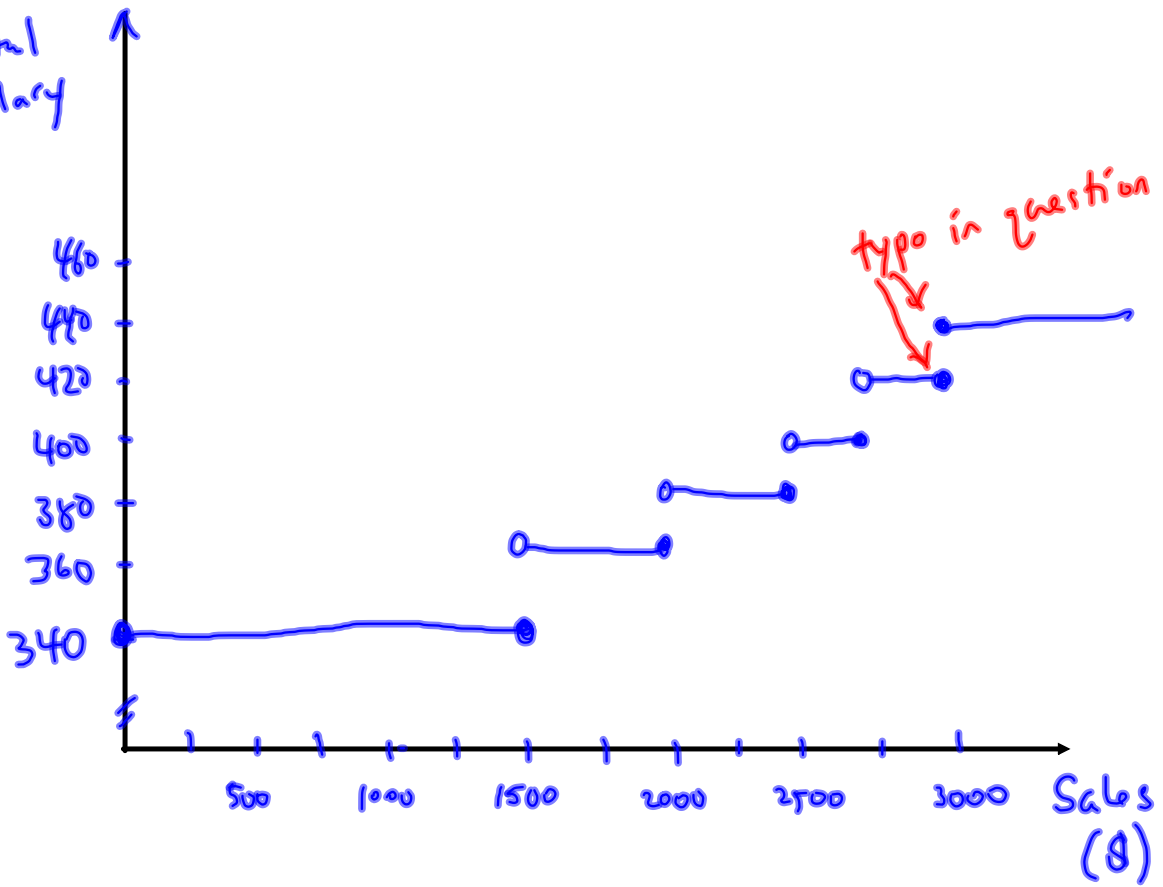
$$8 = -2x + 24$$

$$-16 = -2x$$

$$\cancel{8} = x \text{ this is } \underline{\text{not}} \text{ in 2nd piece}$$

15.

Total salary



$$\text{1st-degree: } y = ax + b \quad (\text{direct } y = ax)$$

$$y = ax$$

$$a = \text{rate of change} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{24 - 0}{4 - 0} = \frac{24}{4} = 6$$

$$y = 6x$$

$$\text{zero-degree: } y = b$$

$$(4, \underline{24}) \rightarrow (14, \underline{24})$$

$$y = 24$$

$$\text{1st-degree: } y = ax + b$$

$$a = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - 24}{20 - 14} = \frac{-24}{6} = -4$$

$$y = -4x + b$$

Plug in (20, 0)

$$0 = -4(20) + b$$

$$0 = -80 + b$$

$$b = 80$$

$$y = -4x + 80$$