

# Piecewise Defined Functions

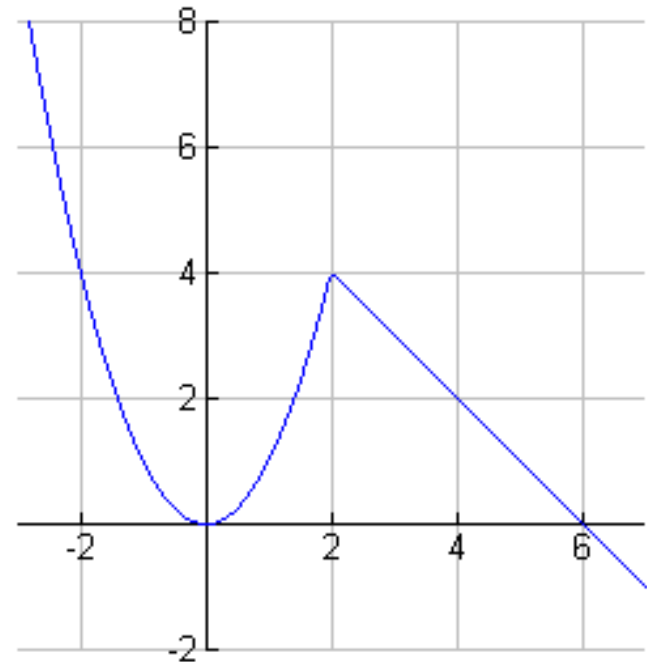
Chapter 2

Section 3

# Piecewise Defined Functions

A function may employ different formulas on different parts of its domain. Such a function is said to be *piecewise defined*.

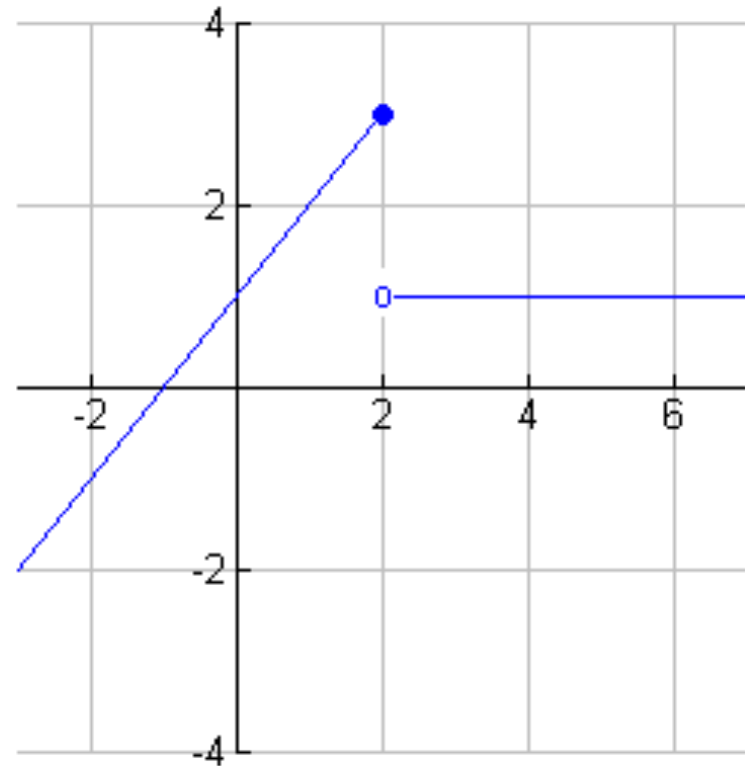
$$y = \begin{cases} x^2 & \text{for } x \leq 2 \\ 6 - x & \text{for } x > 2 \end{cases}$$



# Piecewise Example

Graph the function  $y = g(x)$  given by the formula listed below.

$$g(x) = \begin{cases} x + 1 & \text{for } x \leq 2 \\ 1 & \text{for } x > 2 \end{cases}$$



# Phone Plan Example

A long-distance calling plan charges 99 cents for any call up to 20 minutes in length and 7 cents for each additional minute or part of a minute.

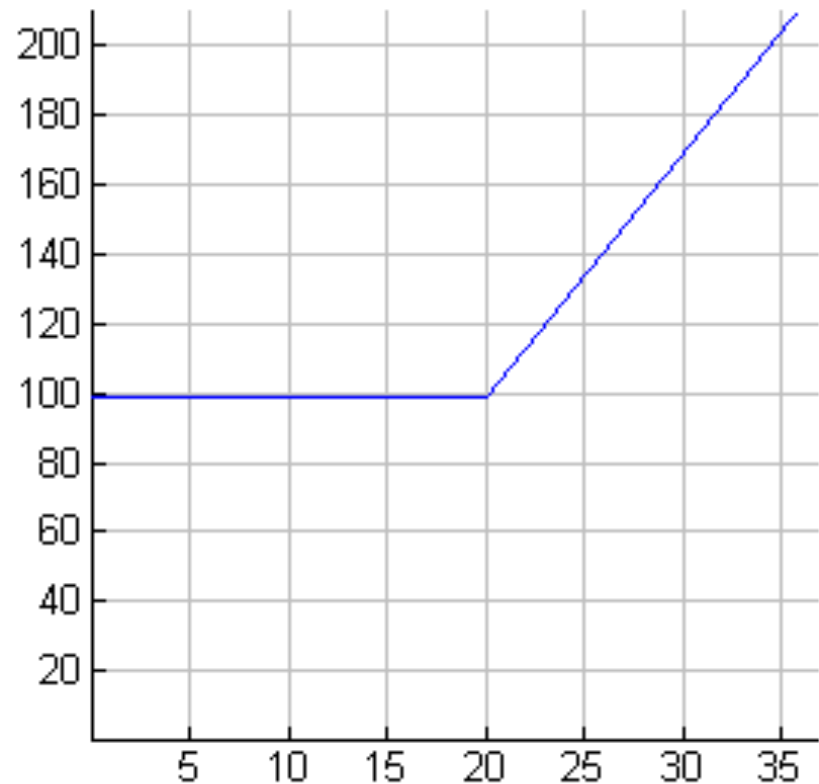
- 1) Use bracket notation to write a formula for the cost,  $C$ , of a call as a function of its length  $t$  in minutes.
- 2) Graph the function.
- 3) State the domain and range of the function.

# Phone Plan Example Solution

$$C = f(t) = \begin{cases} 99 & \text{for } 0 \leq t \leq 20 \\ 7t - 41 & \text{for } t > 20 \end{cases}$$

Domain:  $t > 0$

Range:  $C \geq 99$

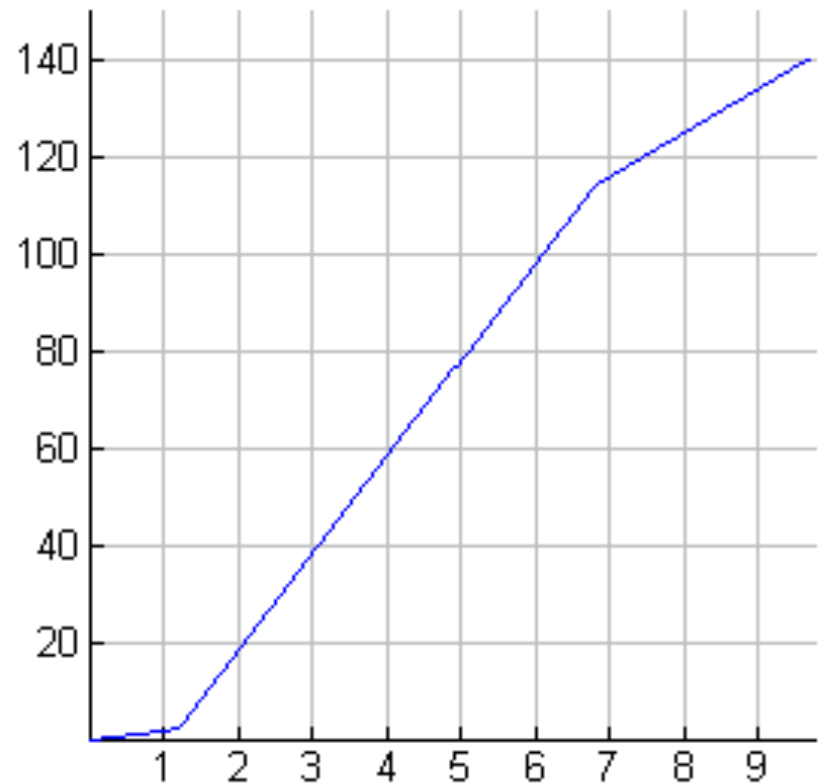


# Ironman Triathlon

The ironman triathlon is a race that consists of three parts: a 2.4 mile swim followed by a 112 mile bike race and then a 26.2 mile marathon. A participant swims steadily at 2 mph, cycles steadily at 20 mph, and then runs steadily at 9 mph. Assuming that not time is lost during the transition from one stage to the next, find a formula for the distance  $d$ , covered in miles, as a function of the elapsed time  $t$  in hours, form the beginning of the race. Graph the function.

# Ironman Triathlon

$$d = \begin{cases} 2t & 0 \leq t \leq 1.2 \\ 20t - 21.6 & 1.2 < t \leq 6.8 \\ 9t + 53.2 & 6.8 < t \leq 9.71 \end{cases}$$



# Absolute Value Function

The ***Absolute Value Function*** is defined by the equation given below.

$$f(x) = |x| = \begin{cases} x & \text{for } x \geq 0 \\ -x & \text{for } x < 0 \end{cases}$$

