

Notes:

Piecewise Functions

Created for you by Ms. Nhotsoubank

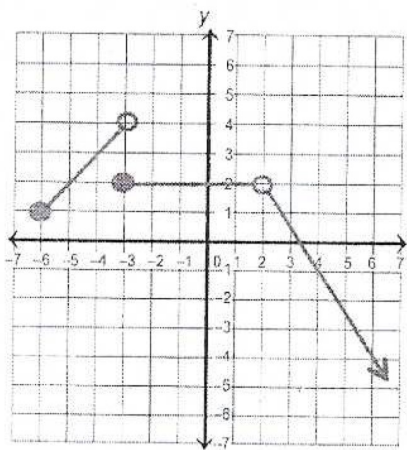
Definitions:

A **Piecewise function** is a function which is defined by "pieces" of two or more different equations applied to different parts of the function's domain. The rule that we use is different for different parts of the domain.

The "pieces" can be all linear like the example shown below or a combination of functional forms.

The graph has three segments.
 ● Means the point is included
 ○ Means it is not

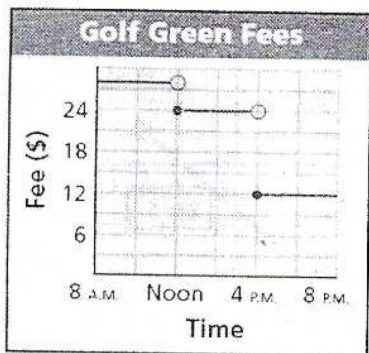
$$f(x) = \begin{cases} x + 7; & -6 \leq x < -3 \\ 2; & -3 \leq x < 2 \\ -\frac{3}{2}x + 5; & x > 2 \end{cases}$$



Example 1

- Piecewise functions can represent real-life situations.

Because the endpoints of each segment of the graph identify the intervals of the domain, use the endpoints and points close to them as domain values in the table.



A description of the piecewise graph is that the green fee is \$28 from 8 a.m. up to noon and \$24 from noon up to 4 p.m.

What is the green fee from 4 p.m. to 9 p.m.? 12

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Evaluating Piecewise Functions

To evaluate any piecewise function for a specific input, find the interval of the domain that contains that input and then use the rule for that interval.

Example 2

Evaluate the piecewise function for $x = -1$ and $x = 7$.

$$f(x) = \begin{cases} 12 & \text{if } x < -3 \\ 15 & \text{if } -3 \leq x < 6 \\ 20 & \text{if } x \geq 6 \end{cases}$$

$f(-1) = 15$ because $-3 \leq -1 < 6$

use the rule for $-3 \leq x < 6$

$f(7) = 20$ b/c $7 \geq 6$, use the rule for $x \geq 6$.

Determining Intervals

Using interval notation, describe the domain of the linear function and the domain of the quadratic function

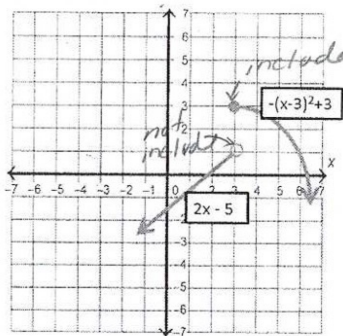
Example 3

The linear function is defined for values in the domain:

- where x is less than 3
- $x < 3$
- $(-\infty, 3)$

The quadratic function is defined for values in the domain:

- where x is greater than or equal to 3
- $x \geq 3$
- $[3, \infty)$



Example 4

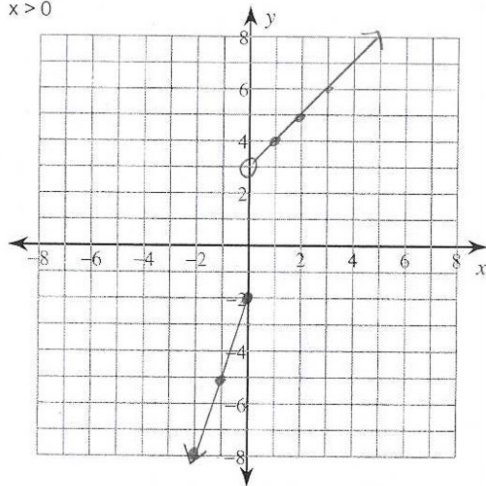
$$\text{Graph } f(x) = \begin{cases} 3x - 2 & \text{if } x \leq 0 \\ x + 3 & \text{if } x > 0 \end{cases}$$

Values ≤ 0

x	f(x) = 3x - 2
0	-2
-1	-5
-2	-8

Values > 0

x	f(x) = x + 3
0	3
1	4
2	5



Example 5

- Write and graph a piecewise function for the parking charges shown on the sign.
- What are the domain and range of the function?

Parking Rates (Weekends)
 \$3 per half hour
 \$8 maximum for 12 hours

$$f(x) = \begin{cases} 3 & \text{if } 0 < x \leq 0.5 \\ 6 & \text{if } 1.5 \leq x \leq 1 \\ 8 & \text{if } 1 < x \leq 12 \end{cases}$$

Part b:

Domain: $0 < x \leq 12$

Range: $3, 6, 8$

