2.6 Piecewise Functions

Objective: To evaluate and graph piecewise functions.

• Up to now, we’ve been looking at functions represented by a single equation.
• In real life, however, functions are represented by a combination of equations, each corresponding to a part of the domain.
• These are called **piecewise functions**.

\[
f(x) = \begin{cases} 
2x - 1 & \text{if } x \leq 1 \\
3x + 1 & \text{if } x > 1
\end{cases}
\]

• One equation gives the value of \( f(x) \) when \( x \leq 1 \)
• And the other when \( x > 1 \)
Evaluating a Piecewise Function

Evaluate the piecewise function at the given values of the independent variable.

\[ f(x) = \begin{cases} 
6x - 1 & \text{if } x < 0 \\
7x + 3 & \text{if } x \geq 0 
\end{cases} \]

a. \( f(-3) \)  
b. \( f(0) \)  
c. \( f(4) \)

Solution part a

To find \( f(-3) \), we let \( x = -3 \).
Because \( -3 \) is less than \( 0 \), we use the first line of the piecewise function.

\[ f(x) = 6x - 1 \quad \text{This is the function's equation for } x < 0. \]
\[ f(-3) = 6(-3) - 1 = -19 \]

(part b)

To find \( f(0) \), we let \( x = 0 \). Since \( x = 0 \), we use the 2\(^{nd}\) line of the piecewise function.

\[ f(x) = 7x + 3 \quad \text{This is the function's equation for } x \geq 0. \]
\[ f(0) = 7(0) + 3 = 3 \]
(part c)
To find $f(4)$, we let $x = 4$.
Because 4 is greater than 0, we use
the second line of the piecewise function.

$$f(x) = 7x + 3$$
$$f(4) = 7(4) + 3 = 31$$

This is the function's equation for $x \geq 0$.

Ex.2 (you try)
Evaluate the piecewise function at the
given values of the independent variable.

$$g(x) = \begin{cases} 
  x + 5 & \text{if } x \geq -5 \\
  -(x + 5) & \text{if } x < -5 
\end{cases}$$

a. $g(0)$  b. $g(-6)$  c. $g(-5)$

Answer

a. $g(0) = 5$

b. $g(-6) = 1$

c. $g(-5) = 0$
Ex. 3: Graph

\[ f(x) = \begin{cases} 
2x - 1 & \text{if } x \leq 1 \\
3x + 1 & \text{if } x > 1 
\end{cases} \]

• For all x's < 1, use the top graph (to the left of 1)
• For all x's ≥ 1, use the bottom graph (to the right of 1)

x=1 is the breaking point of the graph.
To the left is the top equation.
To the right is the bottom equation.

Ex. 4: Graph (you try)

\[ f(x) = \begin{cases} 
x - 1 & \text{if } x > 2 \\
-x + 1 & \text{if } x \leq 2 
\end{cases} \]
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Piecewise function Ws