Topic 3.3

Graphs of Basic Functions; Piecewise Functions

MyMathLab® eCourse Series COLLEGE ALGEBRA Student Access Kit Third Edition

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OBJECTIVES



- Sketching the Graphs of the Basic Functions
- 2. Analyzing Piecewise-Defined Functions
- **3**. Solving Applications of Piecewise-Defined Functions

Constant Function





F(x) = bLinear function with m = 0. Graph of a horizontal line.



Identity Function



f(x) = xLinear function with m = 1 and b = 0.

Square Function





 $f(x) = x^2$

Cube Function





 $f(x) = x^3$

Absolute Value Function





Square Root function





Cube Root Function





Reciprocal Function









 $f(x) = \Box x \Box$

Piecewise-Defined Function

Functions that are defined by a rule that has more than one piece.

The absolute value function can also be defined by a rule that has two different pieces:

$$f(x) = |x| = \begin{cases} x \text{ if } x \ge 0\\ -x \text{ if } x < 0 \end{cases}$$





EXAMPLE

Sketch the function $f(x) = \begin{cases} x^2 & \text{if } x < 1 \\ 1 - x & \text{if } x \ge 1 \end{cases}$



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EXAMPLE

Find a rule that describes the following piecewise function:

 $f(x) = \begin{cases} -3x - 6 & \text{if } -3 < x < -2 \\ 2 & \text{if } -2 \le x \le 1 \\ 2 & \text{if } x > 1 \end{cases}$



EXAMPLE

Steve Forbes, a presidential candidate in 1996, proposed a flat tax to replace the existing U.S. income tax system. In his tax proposal, every adult would pay \$0.00 in taxes on the first \$13,000 earned. They would then pay a flat tax of 17% on everything over \$13,000. Forbes's tax plan is actually a piecewise-defined function.

a. According to Forbes's plan, how much in taxes are owed for someone earning \$50,000 ?

On \$50,000, a person would pay 0% on the first \$13,000 and 17% on the remaining \$37,000. Thus, the taxes owed would be 0.17(37,000) = \$6,290.

b. Find the piecewise function, T(x), that describes the amount of taxes paid, T, as a function of the dollars earned, x, for Forbes's tax plan.

$$T(x) = \begin{cases} 0 & \text{if } x \le 13,000 \\ 0.17(x - 13,000) & \text{if } x > 13,000 \end{cases}$$

EXAMPLE continued

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c. Sketch the piecewise function, T(x).

