Course Number
Instructor
Date

Section P.7 A Library of Functions

Objective: In this lesson you learned how to identify and graph various functions.

I. Linear and Squaring Functions (Pages 77–78)

What you should learn
How to identify and graph linear and squaring functions

The graph of the **linear function** $f(x) = ax + b$ is a line with slope ___$m = a$___ and y-intercept at ___$(0, b)$___.

List several important features of the graph of the linear function $f(x) = ax + b$.

- The domain of the function is the set of all real numbers.
- The range of the function is the set of all real numbers.
- The graph has one intercept (0, b).
- The graph is increasing if m > 0, decreasing if m < 0, and constant if m = 0.

A **constant function** is a special type of linear function having the form ___$f(x) = c$___. The domain of this function is ___all real numbers___ and the range consists of ___a single real number c___.

The **identity function** is a special type of linear function having the form ___$f(x) = x$___. The domain of this function is ___all real numbers___ and the range consists of ___all real numbers___. The identity function has a slope of ___$m = 1$___ and a y-intercept of ___$(0, 0)$___.

The graph of the identity function is a line for which . . .

each x-coordinate equals the corresponding y-coordinate.

List several important features of the U-shaped graph of the **squaring function** $f(x) = x^2$.

- The domain of the function is the set of all real numbers.
- The range of the function is the set of all nonnegative real numbers.
- The function is even.
- The graph has an intercept at (0, 0).
- The graph is decreasing on the interval $(-\infty, 0)$ and increasing on the interval $(0, \infty)$.

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- The graph is symmetric with respect to the y-axis.
- The graph has a relative minimum at (0, 0).

II. Cubic, Square Root, and Reciprocal Functions (Page 79)

What you should learn
How to identify and graph cubic, square root, and reciprocal functions

List several important features of the graph of the **cubic function** $f(x) = x^3$.

- The domain of the function is the set of all real numbers.
- The range of the function is the set of all real numbers.
- The function is odd.
- The graph has an intercept at (0, 0).
- The graph is increasing on the interval $(-\infty, \infty)$.
- The graph is symmetric with respect to the origin.

List several important features of the graph of the **square root function** $f(x) = \sqrt{x}$.

- The domain of the function is the set of all nonnegative real numbers.
- The range of the function is the set of all nonnegative real numbers.
- The graph has an intercept at (0, 0).
- The graph is increasing on the interval $(0, \infty)$.

List several important features of the graph of the **reciprocal function** $f(x) = \dfrac{1}{x}$.

- The domain of the function is $(-\infty, 0) \cup (0, \infty)$.
- The range of the function is $(-\infty, 0) \cup (0, \infty)$.
- The function is odd.
- The graph does not have any intercepts.
- The graph is decreasing on the intervals $(-\infty, 0)$ and $(0, \infty)$.
- The graph is symmetric with respect to the origin.

III. Step and Piecewise-Defined Functions (Pages 80–81)

What you should learn
How to identify and graph step and other piecewise-defined functions

Describe the graph of a step function.

The graph of a step function resembles a set of stairsteps.

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The **greatest integer function,** $f(x) = [\![x]\!]$, is defined as . . .

the greatest integer less than or equal to *x*.

Example 1: Let $f(x) = [\![x]\!]$, the greatest integer function. Find $f(3.74)$.

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List several important features of the graph of the **greatest integer function.**

- The domain of the function is the set of all real numbers.
- The range of the function is the set of all integers.
- The graph has a *y*-intercept at (0, 0) and *x*-intercepts in the interval [0, 1).
- The graph is constant between each pair of consecutive integers.
- The graph jumps vertically one unit at each integer value.

A piecewise-defined function is defined by . . . two or more equations over a specified domain.

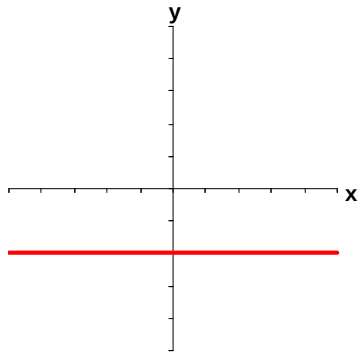
To graph of a piecewise-defined function, . . . graph each equation of the piecewise-defined function separately over the appropriate portion of the domain.

IV. Common Functions (Page 81)

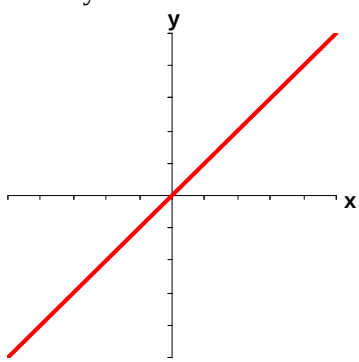
What you should learn
How to recognize graphs of common functions

Sketch an example of each of the following most commonly used functions in algebra.

Constant Function



Identity Function



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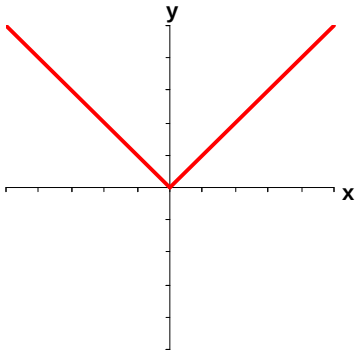
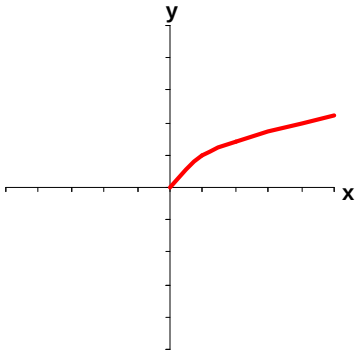
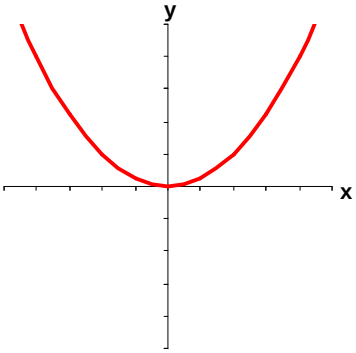
Absolute Value Function



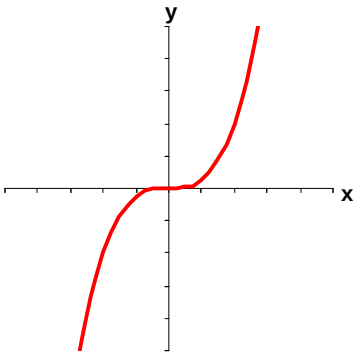
Square Root Function



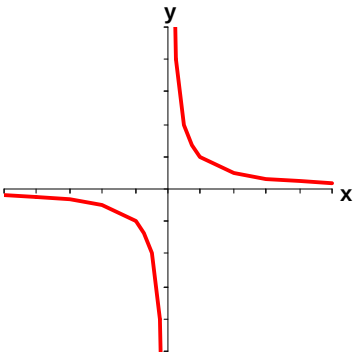
Quadratic Function



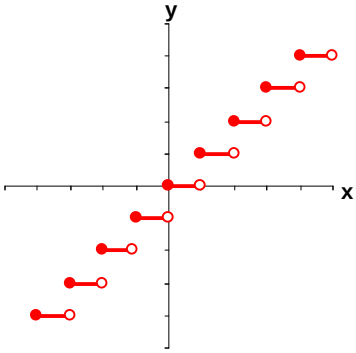
Cubic Function



Reciprocal Function



Greatest Integer Function



Homework Assignment

Page(s)

Exercises

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