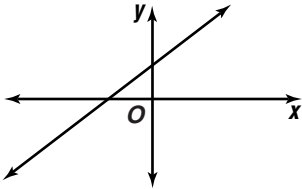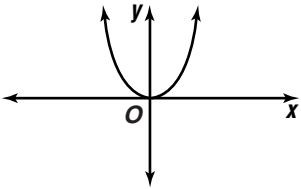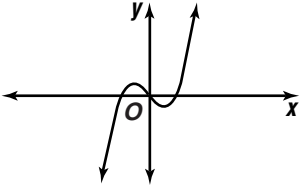# 13-5 Linear and Nonlinear Functions

(Pages 687–691)

As you may recall, an equation whose graph is a straight line is called a linear function. A linear function has an equation that can be written in the form of $y = mx + b$. Equations whose graphs are not straight lines are called **nonlinear functions**. Some nonlinear functions have specific names. A **quadratic function** is nonlinear and has an equation in the form of $y = ax^2 + bx + c$, where $a \neq 0$. Another nonlinear function is a **cubic function**. A cubic function has an equation in the form of $y = ax^3 + bx^2 + cx + d$, where $a \neq 0$.

Function	Equation	Graph
Linear	$y = mx + b$	
Quadratic	$y = ax^2 + bx + c,\ a \neq 0$	
Cubic	$y = ax^3 + bx^2 + cx + d,\ a \neq 0$	

Examples **Determine whether the function is linear or nonlinear.**

a. $y = 4x$

Linear, $y = 4x$ can be written as $y = mx + b$.

b. $y = x^2 + x - 2$

Nonlinear, $y = x^2 + x - 2$ cannot be written as $y = mx + b$

c. $y = \dfrac{7}{x}$

Nonlinear, $y = \dfrac{7}{x}$ cannot be written as $y = mx + b$.

Practice

Determine whether the function is linear or nonlinear.

1. $y = 5$ **2.** $2x + 3y = 10$ **3.** $y = 7x^2$ **4.** $xy = -13$

5. **Standardized Test Practice** Select the nonlinear function.

A $y = -3x - 5$ **B** $y = 0.75$ **C** $y = 3x + x^2$ **D** $y = \frac{1}{2}x + 2$

Answers: 1. linear **2.** linear **3.** nonlinear **4.** nonlinear **5.** C