

**Finding a Derivative** In Exercises 3–24, use the rules of differentiation to find the derivative of the function.

3.  $y = 12$

4.  $f(x) = -9$

5.  $y = x^7$

6.  $y = x^{12}$

7.  $y = \frac{1}{x^5}$

8.  $y = \frac{3}{x^7}$

9.  $f(x) = \sqrt[5]{x}$

10.  $g(x) = \sqrt[4]{x}$

**EXAMPLE 3****Finding the Slope of a Graph**

•••▶ See [LarsonCalculus.com](http://LarsonCalculus.com) for an interactive version of this type of problem.

Find the slope of the graph of

$$f(x) = x^4$$

for each value of  $x$ .

**a.**  $x = -1$     **b.**  $x = 0$     **c.**  $x = 1$

**EXAMPLE 4****Finding an Equation of a Tangent Line**

•••▶ See [LarsonCalculus.com](http://LarsonCalculus.com) for an interactive version of this type of example.

Find an equation of the tangent line to the graph of  $f(x) = x^2$  when  $x = -2$ .

**EXAMPLE 7****Using the Sum a****Function**

a.  $f(x) = x^3 - 4x + 5$

b.  $g(x) = -\frac{x^4}{2} + 3x^3 - 2x$

c.  $y = \frac{3x^2 - x + 1}{x} = 3x - 1 + \frac{1}{x}$

**EXAMPLE 8****Deriva**

•••▶ See [LarsonCalculus.com](http://LarsonCalculus.com)

**Function**

a.  $y = 2 \sin x$

b.  $y = \frac{\sin x}{2} = \frac{1}{2} \sin x$

c.  $y = x + \cos x$

d.  $\cos x - \frac{\pi}{3} \sin x$

**EXAMPLE 9****Finding Average Velocity of a Falling Object**

A billiard ball is dropped from a height of 100 feet. The ball's height  $s$  at time  $t$  is the position function

$$s = -16t^2 + 100$$

Position function

where  $s$  is measured in feet and  $t$  is measured in seconds. Find the average velocity over each of the following time intervals.

- a.  $[1, 2]$     b.  $[1, 1.5]$     c.  $[1, 1.1]$

**EXAMPLE 10** Using the Derivative to Find Velocity

At time  $t = 0$ , a diver jumps from a platform diving board that is 32 feet above the water (see Figure 2.21). Because the initial velocity of the diver is 16 feet per second, the position of the diver is

$$s(t) = -16t^2 + 16t + 32 \quad \text{Position function}$$

where  $s$  is measured in feet and  $t$  is measured in seconds.

- a. When does the diver hit the water?
- b. What is the diver's velocity at impact?