

Section 9: The derivative at $x = a$

9.1 Use the definition of the derivative to find the derivative of $f(x) = 3x + 1$ at $x = 2$. Here are some steps.

(a) Find

$$f(2 + h)$$

(b) Find

$$\frac{f(2 + h) - f(2)}{h}$$

(c) Find

$$\lim_{h \rightarrow 0} \frac{f(2 + h) - f(2)}{h}$$

9.2 Use the definition of the derivative to find the derivative of $f(x) = 2x^2 - 3$ at $x = 4$. Here are some steps.

(a) Find

$$f(4 + h)$$

(b) Find

$$\frac{f(4 + h) - f(4)}{h}$$

(c) Find

$$\lim_{h \rightarrow 0} \frac{f(4 + h) - f(4)}{h}$$

9.3 Use the definition of the derivative to find the derivative of $f(x) = -3x^2 + 2x - 4$ at $x = 1$. Here are some steps.

(a) Find

$$f(1 + h)$$

(b) Find

$$\frac{f(1 + h) - f(1)}{h}$$

(c) Find

$$\lim_{h \rightarrow 0} \frac{f(1 + h) - f(1)}{h}$$

9.4 Use the rules to find the derivatives of the following functions at the specified values.

(a) $f(x) = 5$ at $x = 2$.

(b) $f(x) = 1$ at $x = 3$.

9.5 Use the rules to find the derivatives of the following functions at the specified values.

(a) $f(x) = x^3$ at $x = 2$.

(b) $f(x) = x^{1/2}$ at $x = 3$.

(c) $f(x) = x$ at $x = 4$.

(d) $f(x) = x^{-1}$ at $x = 2$.

9.6 Use the rules to find the derivatives of the following functions at the specified values.

(a) $f(x) = 7x^3$ at $x = 2$.

(b) $f(x) = 12x^{1/2}$ at $x = 3$.

(c) $f(x) = 3x$ at $x = 4$.

(d) $f(x) = 7x^{-1}$ at $x = 2$.

9.7 Use the rules to find the derivatives of the following functions at the specified values.

(a) $f(x) = .02x^3$ at $x = 2$.

(b) $f(x) = .12x^{1/2}$ at $x = 3$.

(c) $f(x) = .01x$ at $x = 4$.

(d) $f(x) = 1.3x^{-1}$ at $x = 2$.

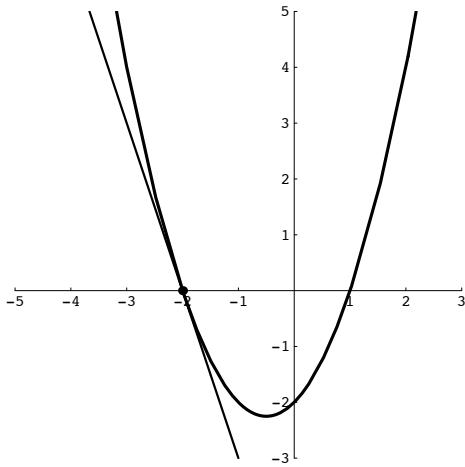
9.8 Use the rules to find the derivatives of the following functions at the specified values.

(a) $f(x) = -.02x^2 + 5x - 1$ at $x = 2$.

(b) $f(x) = -.12x^2 + 30x - 1200$ at $x = 3$.

9.9 Let $f(x) = -2x^2 + x + 1$. Find the equation of the line tangent to the graph of $y = f(x)$ at the point $(-3, f(-3))$.

- 9.10** Let $f(x) = x^2 + x - 2$. Find the equation of the line tangent to the graph of $f(x)$ at the point $(-2, f(-2))$ shown below.



- 9.11** Let $f(x) = -x^2 - 4x$. Find the equation of the line tangent to the graph of $f(x)$ at the point shown $(2, f(2))$.

- 9.12** The revenue from the sale of x cellphone towers is given by

$$R(x) = 1800x - 5x^2.$$

- (a) Sum What is the change in revenue if production is changed from $x = 12$ to $x = 13$ cellphone towers?
- (b) What is the (instantaneous) rate of change in revenue at $x = 12$?

- 9.13** The revenue from the sale of x high end cameras is given by

$$R(x) = 1000x - 2x^2.$$

- (a) Sum What is the change in revenue if production is changed from $x = 10$ to $x = 11$ cellphone towers?
- (b) What is the (instantaneous) rate of change in revenue at $x = 10$?

- 9.14** Let $g(x) = x^3 + 2x + 5$. Find an equation for the line tangent to the graph of $g(x)$ at the point $(0, g(0))$.

Equation of tangent line: