

### 3.3. DERIVATIVES OF PRODUCTS AND QUOTIENTS

$$(1) \frac{d}{dx}[f(x)g(x)] =$$

$$(2) \frac{d}{dx} \left[ \frac{f(x)}{g(x)} \right] =$$

#### Examples

**Example 3.3.1.** Find  $f'(x)$  if  $f(x) = (x^2 + 2x + 1)(3x^4 - 2x^2 + 4)$

**Example 3.3.2.** Find  $g'(t)$  if  $g(t) = 5t^4(\sqrt[3]{t} + 1)$

**Example 3.3.3.** Find  $f'(w)$  if  $f(w) = \frac{w^2 + 5w + 5}{3w^4 + w^2 - 1}$

**Example 3.3.4.** Find  $h'(x)$  if  $h(x) = \frac{\sqrt{x} + 1}{\sqrt{x} - 1}$

**Example 3.3.5.** Find  $h'(x)$  for  $h(x) = \frac{e^x}{f(x)}$

**Example 3.3.6.** Find the derivative of  $y = e^x \ln(x^3)$

**Example 3.3.7.** Find the derivative of  $f(x) = \frac{e^x}{3x - 5x^2}$

**Example 3.3.8.** Find the equation of the line tangent to the graph of  $f(x) = \frac{x-4}{x+2}$  at  $(-1, -5)$ .

**Example 3.3.9.** Find  $f'(x)$  and find the value(s) of  $x$  where  $f'(x) = 0$  for

$$f(x) = \frac{x}{x^2 + 9}$$

**Example 3.3.10.** *A communications company has installed a new cable television system in a city. The total number  $N$  (in thousands) of subscribers  $t$  months after the installation of the system is given by*

$$N(t) = \frac{180t}{t+4}$$

(1) Find  $N'(t)$ .

(2) Find  $N'(16)$ .