

# Sums, Products, and Quotients

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**Sums and Difference Rule:**  $f(x) = u \pm v \Rightarrow f'(x) = u' \pm v'$

Also written in:  $F(x) = f(x) \pm g(x) \Rightarrow F'(x) = f'(x) \pm g'(x)$

**Product Rule:**  $f(x) = uv \Rightarrow f'(x) = u'v + uv'$

Also written in:  $F(x) = f(x) * g(x) \Rightarrow F'(x) = f'(x) * g(x) + f(x) * g'(x)$

**Quotient Rule:**  $f(x) = \frac{u}{v} \Rightarrow f'(x) = \frac{u'v - uv'}{v^2}$

Also written in:  $F(x) = \frac{f(x)}{g(x)} \Rightarrow F'(x) = \frac{f'(x)*g(x) - f(x)*g'(x)}{(g(x))^2}$

**Example:** Find the derivative  $f(x) = (3x - 2) * (5x + 6)$

**Solution:**

$$f'(x) = (3x - 2)'(5x + 6) + (3x - 2)(5x + 6)' = 3 * (5x + 6) + (3x - 2) * 5 = 15x + 18 + 15x - 10 = 30x + 8$$

**Example:** Find the derivative  $f(x) = \frac{(3x-2)}{(5x+6)}$

**Sample:**

$$\begin{aligned} f'(x) &= \frac{(3x-2)'(5x+6) - (3x-2)(5x+6)'}{(5x+6)^2} \\ &= \frac{3*(5x+6) - (3x-2)*5}{(5x+6)^2} \\ &= \frac{(15x+18) - (15x-10)}{(5x+6)^2} \\ &= \frac{15x+18-15x+10}{(5x+6)^2} \\ &= \frac{28}{(5x+6)^2} \end{aligned}$$

**Questions:** Find the derivative of each of the following functions

①  $f(x) = (3x^2 + 2x + 1)(2 - 5x)$

②  $f(x) = \frac{1}{x}$

③  $f(x) = \frac{x^2+2}{3-7x}$