Example

Suppose \( f \) and \( g \) are functions which are differentiable at \( x = 1 \), with

\[
f(1) = 6, \quad f'(1) = -3, \quad g(1) = -1, \quad g'(1) = 3.
\]

Evaluate: \[
\frac{d}{dx} (2fg - 3g) \bigg|_{x=1}.
\]

Solution: Using the product and sum differentiation rules,

\[
\frac{d}{dx} (2f(x)g(x) - 3g(x)) = 2 (f(x) \cdot g'(x) + f'(x) \cdot g(x)) - 3g'(x).
\]

So

\[
\frac{d}{dx} (2fg - 3g) \bigg|_{x=1} = \left[ 2 (f(x) \cdot g'(x) + f'(x) \cdot g(x)) - 3g'(x) \right]_{x=1}
\]

\[
= 2 (f(1)g'(1) + f'(1)g(1)) - 3g'(1)
\]

\[
= 2 ((6)(3) + (-3)(-1)) - 3 \cdot 3
\]

\[
= 42 - 9
\]

\[
= 33.
\]