Find $h'(2)$, given $h(x) = f(g(x)), f(u) = u^2 - 1, g(2) = 3$, and $g'(2) = -1$.

Solution

$$
\begin{aligned}
h(x) &= f(g(x)), \text{ therefore} \\
h'(x) &= f'(g(x)) \times g'(x) \\
f(u) &= u^2 - 1, g(2) = 3, g'(2) = -1 \\
\text{Now, } h'(2) &= f'(g(2)) \times g'(2) \\
&= f'(3) \times g'(2). \\
\text{Since } f(u) &= u^2 - 1, f'(u) = 2u, \text{ and } f'(3) = 6, \\
h'(2) &= 6(-1) \\
&= -6.
\end{aligned}
$$