

PDF 2.060 Chain Rule

The Chain Rule states

If $h(x) = f \circ g(x)$, then $f'(g(x))g'(x)$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

Newton Notation

Leibniz Notation

Proof

Example 1

Determine the derivative of $h(x) = (10x^3 - 7x^2 + 3x - 9)^{14}$

Example 2

Determine the derivative of $y = (x^2 + x)^{\frac{3}{2}}$

Example 3

If $y = 2u^4 - 3u^2 + u - 1$ and if $u = 4\sqrt{x}$, then determine the value of $\frac{dy}{dx}$ at $x = 1$.

Example 4

Suppose $f(12) = -7$, $g(3) = 12$, $f'(12) = 11$ and $g'(3) = 9$. If $h(x) = f(g(x))$, then evaluate $h'(3)$.

Example 5

Evaluate $k'(-1)$ where $k(x) = \left(\frac{x^3-3}{x^3+3}\right)^8$