The chain Rule

If g is diff. @ x and f is diff. @ $g(x)$, then the composite fct $F = f(g(x))$ is diff. @ x and

$$F'(x) = f'(g(x))\, g'(x).$$

composition & decomposition of fcts.

examples

$y = \sqrt{3x^2 - 4x + 6}$

$f(x) = 5\cos^{-4}(x)$

$h(t) = e^{(4\sqrt{t} + t^2)}$

$s = 6(\sec\theta - \tan\theta)^{3/2}$

$y = \frac{1}{x}\sin^{-5}x - \frac{x}{3}\cos^3 x$

$z = (2x-5)^{-1}(x^2 - 5x)^6$

$h(m) = m\tan(2\sqrt{m}) + 7$

The chain Rule in Leibnitz notation

If $y = f(u)$ & $u = g(x)$

then $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

$y = \cos(e^{-\theta^2})$

$Q = (p^{-3/4}\sin t)^{4/3}$

$g(x) = \frac{1}{6}(1 + \cos^2(7t))^3$

$\frac{d}{dx} e^{u(x)}$

$\frac{d}{dx} a^x$, $a > 0, a \neq 1$

$\frac{d}{dx} a^{u(x)}$