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

$$f(x) = (3x+6)^5$$

$$u = 3x+6 \qquad y = u^5$$

$$\frac{du}{dx} = u' = 3 \qquad \frac{dy}{du} = y' = 5u^4$$

$$f'(x) = u' \circ y'$$

$$= 3 \circ 5u^4 = 15u^4 = 15(3x+6)^4$$

$$y = f(x) = 3x^2 + 6x + 2$$

$$\frac{dy}{dx} \quad y' = f'(x) = 6x + 6$$

$y = \frac{1}{x+1}$ $y' = \frac{(x+1)\cdot 0 - 1\cdot 1}{(x+1)^2}$

$u = x+1$ $y = \frac{1}{u} = 1u^{-1}$

$u' = 1$ $y' = -u^{-2}$

$\frac{dy}{dx} = 1\cdot -u^{-2} = \frac{-1}{u^2} = \frac{-1}{(x+1)^2}$

$$y = \sin(2x)$$

$u = 2x$ $\quad y = \sin u$

$u' = 2$ $\quad y' = \cos u$

$$\frac{dy}{dx} = u' \cdot y' = 2\cos u = 2\cos(2x)$$

$$y = x\cos(3x^2)$$

$$y' = x \cdot -6x\sin(3x^2) + \cos(3x^2) \cdot 1$$

$$y' = -6x^2\sin(3x^2) + \cos(3x^2)$$

Sidebar

$m = \cos(3x^2)$

$u = 3x^2$ $\quad m = \cos u$

$u' = 6x$ $\quad m' = -\sin u$

$6x \cdot -\sin u$

$-6x\sin(3x^2)$

$$y = \sqrt{3x^2 - x + 1} = (3x^2 - x + 1)^{1/2}$$

$u = 3x^2 - x + 1$ $\quad y = u^{1/2}$

$u' = 6x - 1$ $\quad y' = \frac{1}{2}u^{-1/2} = \frac{1}{2u^{1/2}}$

$$\frac{dy}{dx} = (6x-1) \cdot \frac{1}{2u^{1/2}}$$

$$= \frac{6x-1}{2(3x^2-x+1)^{1/2}}$$