미분법 공식

(1) $y=c \rightarrow y'=0$

(2) $y=x^n \rightarrow y'=nx^{n-1}$

$ex)\ y=x^3 \rightarrow y'=3x^2$

$$y=\sqrt{x}=x^{\frac{1}{2}} \rightarrow y'=\frac{1}{2}x^{-\frac{1}{2}}=\frac{1}{2}\cdot\frac{1}{x^{\frac{1}{2}}}=\frac{1}{2}\frac{1}{\sqrt{x}}=\frac{1}{2\sqrt{x}}$$

(3) $y=f(x)\pm g(x) \rightarrow y'=f'(x)\pm g'(x)$

$*\, y=\Sigma\square \rightarrow y'=\Sigma\square'$

(4) $y=f(x)\cdot g(x) \rightarrow y'=f'(x)g(x)+f(x)g'(x)$

$*\,(mn)'=m'n+mn'$

$(mn\ell)'=m'n\ell+mn'\ell+mn\ell'$

➡

$$F(x)=f(x)\cdot g(x) \rightarrow F'(x)=\lim_{h\to 0}\frac{F(x+h)-F(x)}{x+h-x}$$

$$=\lim_{h\to 0}\frac{f(x+h)g(x+h)-f(x)g(x)}{h}$$

$$=\lim_{h\to 0}\frac{\{f(x+h)-f(x)\}g(x+h)+f(x)g(x+h)-f(x)g(x)}{h}$$

$$=\lim_{h\to 0}\frac{\{f(x+h)-f(x)\}g(x+h)+f(x)\{g(x+h)-g(x)\}}{h}$$

$$=f'(x)g(x)+f(x)g'(x)$$

(5) $\begin{cases} x=f(t) \rightarrow \dfrac{dx}{dt}=f'(t) \\ y=g(x) \rightarrow \dfrac{dy}{dt}=g'(t) \end{cases}$

$$\therefore\ \frac{dy}{dx}=\frac{\frac{dy}{dt}}{\frac{dx}{dt}}=\frac{g'(t)}{f'(t)}$$

예제1

$$\begin{cases} x=2t^3 \\ y=4t^2 \end{cases} \rightarrow \frac{dy}{dx}=\frac{8t}{6t^2}=\frac{8}{6t}=\frac{4}{3t}$$

(6) $y=f(ax+b) \rightarrow y'=f'(ax+b)a$

예제2

$y=(2x-1)^4 \rightarrow y'=4(2x-1)^3\cdot 2$

$y=f(g(x)) \rightarrow y'=f'(g(x))\cdot g'(x)$

$y=f(x)^n \rightarrow y'=nf(x)^{n-1}\cdot f'(x)$

(7) $y=x^2 \rightarrow y'=2x$

$\dfrac{dy}{dx}=2x \qquad dy=2x\cdot dx$

$*\,x^2+y^2=r^2 \ \rightarrow 2x\,dx+2y\,dy=0\ :\ 2x+2y\dfrac{dy}{dx}=0$

$2x+2y\ y'=0$

$\rightarrow 2x\,dx+2y\,dy=0\ :\ 2x\dfrac{dx}{dy}+2y=0$

$2x\ x'+2y=0$

$\rightarrow 2x\dfrac{dx}{dt}+2y\dfrac{dy}{dt}=0\ :\ 2x\,x'+2y\,y'=0$