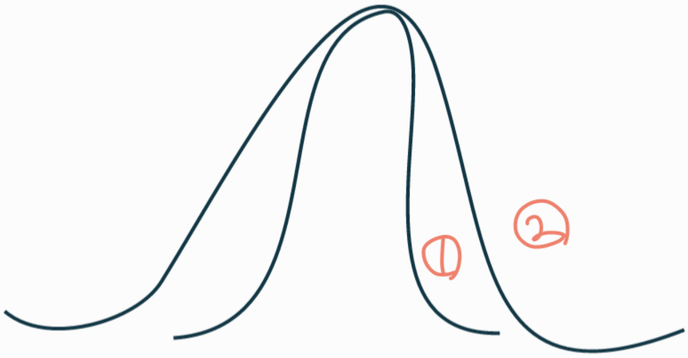
미분 = 기울기

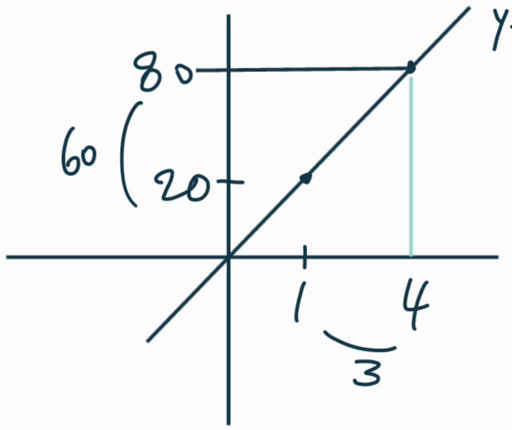
↳ 음수

양수



①이 더 기울어짐 → 미분大

② 미분 小



$y=20x$

$\frac{60}{3} = 20$

$y=30x$라면 미분시 30인 것

$\frac{2940}{98}$

적분

기하학적의미
: 면적

$\sum \underset{\Delta x}{\square} f(0)$

$\Delta x \to 0$

$\hookrightarrow dx$

미세한

$\sum \boxed{f(x)} \Delta x =$ 불연속

$\int f(x)dx =$ 연속

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

$\hookrightarrow f'(a)$

$f(x, y)$

$$\frac{\partial f}{\partial x} = \lim \frac{f(a+h, y) - f(a, y)}{h}$$

$$\frac{\partial f}{\partial y} = \lim \frac{f(x, b+h) - f(x, b)}{h} = f'(x, b)$$

$$\int n^2 dx = \frac{x^{n+1}}{n+1} + C$$

미분

$$\int_1^2 x^2 dx = \left[\frac{x^3}{3}\right]_1^2 = \frac{2^3}{3} - \frac{1}{3} = \frac{7}{3}$$

$$\int_2^4 2x^3 dx = 2\int_2^4 x^3 dx = 2\left[\frac{x^4}{4}\right]_2^4 = 2\times\left[\frac{4^4}{4} - \frac{2^4}{4}\right] = 2\times\frac{1}{4}(4^4 - 2^4) = \frac{1}{2}2^4(2^4 - 1) = 8\times 15$$

$\int_1^2 t^2 dt = ?\quad \left[\frac{t^3}{3}\right]_1^2 = \frac{2^3}{3} - \frac{1}{3} = \frac{7}{3}$

$\int x^0 = 1$

$\frac{x^{n+1}}{n+1} = \frac{x^{0+1}}{1} = x$

$\int_1^2 (2x^2+6x+9)\,dx = ?\quad 2\int_1^2 x^2 dx + 6\int_1^2 x\,dx + 9\int_1^2 1\,dx$

$= 2\left[\frac{x^3}{3}\right]_1^2 + 6\left[\frac{x^2}{2}\right]_1^2 + 9\left[x\right]_1^2$

1?

$= 2\left(\frac{2^3}{3} - \frac{1}{3}\right) + 6\left(\frac{4}{2} - \frac{1}{2}\right) + 9$

$= 2\cdot\frac{7}{3} + 6\cdot\frac{3}{2} + 9 = \frac{14}{3} + 27$?

$\int_{-2}^2 (2s^2+6x)\,ds = ?\quad 2\int_{-2}^2 \frac{s^3}{3} + 6\int_{-2}^2 \frac{x^2}{2} = 2\left[\frac{s^3}{3}\right]_{-2}^2 + 6\left[\frac{x^2}{2}\right]_{-2}^2$

$= 2\left(\frac{8}{3} - \frac{8}{3}\right) + 6\left(\frac{4}{2} + \frac{4}{2}\right)$

$= 24$?

$\int_{-1}^3 (t^2+2t+9)\,dt = ?$

$= \left[\frac{t^3}{3}\right]_{-1}^3 + 2\left[\frac{t^2}{2}\right]_{-1}^3 + 9\left[x\right]_{-1}^3$

$\frac{3^3}{3} - \frac{(-1)^3}{3} + 2\left(\frac{2\times3}{2} - \frac{2\times(-1)}{2}\right) + 36$

$= 9 + \frac{1}{3} + 8 + 36 = 53 + \frac{1}{3}$

g = 중력 가속도

= 9.8 m/s

$v = \frac{s}{t}$

$\frac{1}{2}gt^2$ = 이동거리

$v = \underset{9.8}{g}t$

$\int gt\,dx = g\frac{t^2}{2}$

$\frac{df}{dx}$

$\frac{d^2f}{dx^2}$ (f를 두번미분)

$f(x) = 3x^2$ 거리

$f' = 6x$ 속도

$f' = 6$ 가속도

$2\int_{-2}^2 s^2 dx + 6\int_{-2}^2 s\,dx = ?\quad 2\left[\frac{s^3}{3}\right]_{-2}^2 + 6\left[\frac{s^2}{2}\right]_{-2}^2$

$2\times2\int_0^2 s^2\,dx$

$= 2\times\left(\frac{8}{3} - \left(\frac{-8}{3}\right)\right) + 6\left(\frac{4}{2} - \frac{4}{2}\right)$

∇ del = gradient Descent

$\nabla f = \begin{pmatrix} \frac{\partial f}{\partial x} \\ \frac{\partial f}{\partial y} \\ \frac{\partial f}{\partial z} \end{pmatrix} \quad \nabla = \begin{pmatrix} \frac{\partial}{\partial x} \\ \frac{\partial}{\partial y} \\ \partial z \end{pmatrix}$

$$W_1 = W_1 - \alpha \frac{\partial J}{\partial W}$$

$$W_2 = W_2 - \alpha \frac{\partial J}{\partial W_2}$$

$$\vdots$$

$$W_{100} = W_{100} - \alpha \frac{\partial J}{\partial W_{100}}$$

$$\begin{bmatrix} W_1 \\ W_2 \\ \vdots \\ W_{100} \end{bmatrix} = \begin{bmatrix} W_1 \\ W_2 \\ \vdots \\ W_{100} \end{bmatrix} - \alpha \begin{bmatrix} \frac{\partial}{\partial W_1} \\ \frac{\partial}{\partial W_2} \\ \vdots \\ \frac{\partial}{\partial W_{100}} \end{bmatrix} J$$

$$W := W - \alpha \nabla_W J$$

Hessian

$$f(x,y) = \quad = \text{대칭행렬}$$