~기초수학

· 미분

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

ex) $y = e^{\sin x} \rightarrow y' = e^{\sin x} \cdot \cos x$ ex2) $y = e^{\cos x + \ln x + e^{x^2}} \rightarrow y' = e^{\cos x + \ln x + e^{x^2}} \cdot (-\sin x + \frac{1}{x} + 2x e^{x^2})$

· 편미분

$z = f(x,y) = x^2 + 2xy + y^3 + 1 \Rightarrow$ 변수가 2개 이상

↓

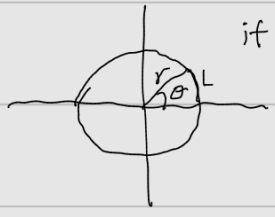
x에 대하여 편미분 $\Rightarrow$ y는 상수 취급 $= \frac{\partial f(x,y)}{\partial x} = \nabla_x z = 2x + 2y$

y에 대하여 편미분 $\Rightarrow$ x는 상수 취급 $= \frac{\partial f(x,y)}{\partial y} = \nabla_y z = 2x + 3y^2$

· 적분 $\int f(x)\,dx = F(x) + C$

ex) $\int \frac{3x^2 + \sec^2 x + \frac{1}{x} + 2xe^{x^2}}{x^3 + \tan x + \ln x + e^{x^2}} dx = \ln(x^3 + \tan x + \ln x + e^{x^2}) + C$

· radian $\pi = 3.141592\cdots$ rad



if $r = L \Rightarrow \theta = 1$ rad

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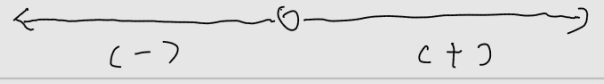
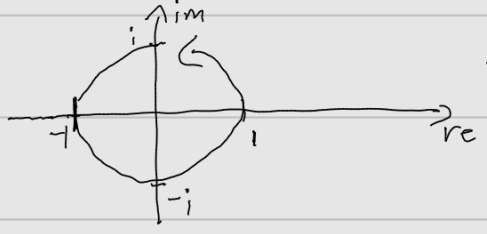
→ 1D scalar (방향 X)

· 

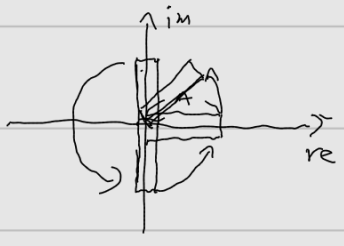
→ 1D vector (방향 O)

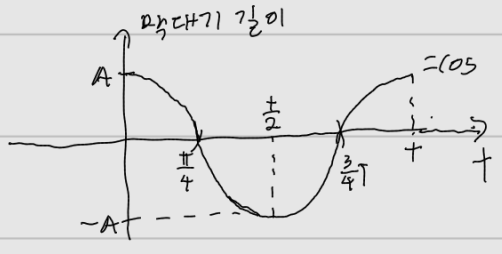
} 아직까진 실수 이상 이식

· 허수 $x^2 < 0 \Rightarrow$ 곱해줄까 $= i =$ 허수 $i = \sqrt{-1}$ $i^2 = -1$ $i^3 = -i$ $i^4 = 1$



→ 2D 회전



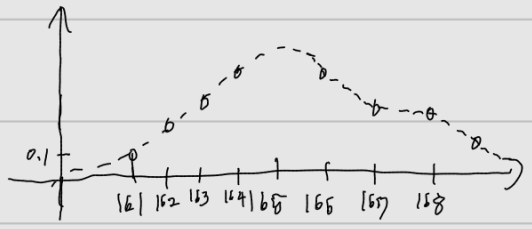


cos: 막대기 시작위치: 

sin:  : 시작위치

• 확률

• random variable ex) 키



⇒ 키에 대한 **확률 분포**

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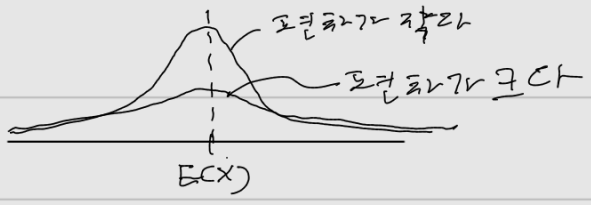
확률 밀도 함수 (P.D.F)

• 정상 분포 = 정규분포 (normal distribution)

$X = \{x_1, \cdots x_n\}$ $\underbrace{E[X] = \bar{X} = \mu_X = \text{mean}}_{\text{기댓값(평균)}} = \frac{\sum x_i}{n} = \sum_{i=1} x_i P_X(x_i)$

ex) 주사위 $\rightarrow X = \{1, 2, \cdots 6\}$ $P_X(x_i) = \frac{1}{6}$ $E(X) = \frac{\sum x_i}{6} = \frac{1+2+\cdots+6}{6} = \frac{1}{6}\cdot 1 + \frac{1}{6}\cdot 2 + \cdots \frac{1}{6}\cdot 6$

• $E(X) = \sum_{x \in X} x_i P_X(x_i)$



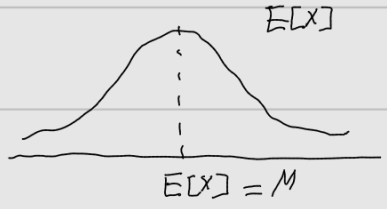
ex) $X = (8, 10, 12)$ 편차 $= (-2, 0, 2)$

• $V[X] = \frac{\sum (x_i - \bar{X})^2}{n} = E[(X-\bar{X})^2]$ ∴ 분산 = 편차의 제곱의 평균

$= E[X^2] - E[X]^2$ ↳ $= E[X^2 - 2X\bar{X} + \bar{X}^2] = E[X^2] - 2\bar{X}E[X] + \bar{X}^2 = E[X^2] - E[X]^2$

($2\bar{X}E[X]$: $\bar{X} = E[X]$, $\bar{X}^2 = E[X]^2$)

• 표준편차 $= \sqrt{V[X]} = \alpha$



• $N(M, \alpha^2) = N(E[X], V[X])$

$= \frac{1}{\sqrt{2\pi\alpha^2}} \exp\left[-\frac{(x-M)^2}{2\alpha^2}\right]$

예제) 동전 던지기 $C_1, C_2, C_3 \rightarrow$ F : 100 , B : -100

경우의 수: BBB, BFF, FBF, FFB, BBF, BFB, FBB, FFF

BBB → -300 / BFF, FBF, FFB → -100 / BBF, BFB, FBB → 100 / FFF → 300

→ X

$X = \{-300, -100, 100, 300\}$ $P_X(x) = \left[\frac{1}{8}, \frac{3}{8}, \frac{3}{8}, \frac{1}{8}\right]$

$E[X] = \sum_{i=1}^{4} x_i P_X(x) = -\frac{300}{8} - \frac{300}{8} + \frac{300}{8} + \frac{300}{8} = 0$