Recap of Previous Lecture

Topic

Max and Min of Random Variables

Topics to be Covered

Topic

Max and Min of Random Variables (Part-02)

Transformation of Random Variables:

If x is a random variable $\longrightarrow$ $f_X(x)$ $\longrightarrow$ prob. density Function

$\longrightarrow$ x is a random variable

What is Transformation

$$Y = \phi(x) = \text{one-one Function}$$

$$\boxed{x = \phi^{-1}(y)} \quad \text{Invertible function}$$

$P[(x, x+dx)] \longrightarrow P[X \in (x, x+dx)]$

$\downarrow$ Random var.

$P[(y, y+dy)] \longrightarrow P[Y \in (y, y+dy)]$

$y = x^2 \quad y = x^3$

$y = \sqrt{x}$

Transformation

Transmitter

Reciever

$$P[X \in (x, x+dx)] = P[Y \in (y, y+dy)]$$

Cdf $\Rightarrow$ $\underbrace{\dfrac{F_X(x+dx) - F_X(x)}{dx} \cdot dx}_{F_X'(x) \cdot dx}$

Form

pdf $\longrightarrow$ $f_X(x)\, dx = f_Y(y)\, dy$

$$\boxed{f_Y(y) = \dfrac{\left[f_X(x)\right]_{x = \phi^{-1}(y)}}{\left|\dfrac{dy}{dx}\right|_{x = \phi^{-1}(y)}}}$$

$\swarrow$ magnitude

$y = f(x)$

$x = f(y)$

$x = f^{-1}(y)$
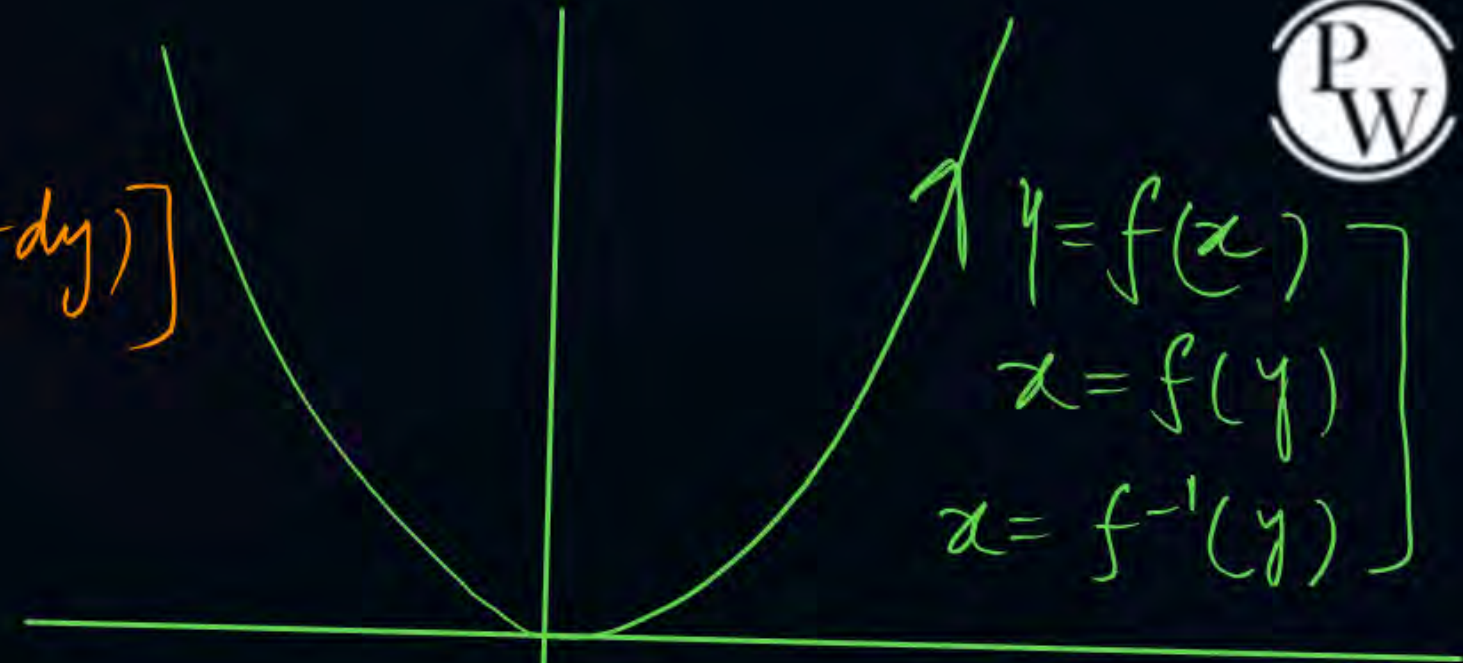
both are
one-one
Function

$$f_Y(y) = \dfrac{\left[f_X(x)\right]_{x = \phi^{-1}(y)}}{\left|\dfrac{dy}{dx}\right|_{x = \phi^{-1}(y)}}$$

$$f_X(x) = e^{-x} \quad x \geq 0$$

$$\boxed{f_Y(y) = \frac{f_X(x)\big|_{x=\phi^{-1}(y)}}{\left|\dfrac{dy}{dx}\right|_{x=\phi^{-1}(y)}}}$$

Exponetial random variable
find the $Y = \sqrt{x}$
Trans form The
random variable

step ① $y = \sqrt{x}$

$x = y^2$

$x = \phi^{-1}(y)$

$x = y^2$

$$f_Y(y) = \frac{e^{-x}\big|_{x=y^2}}{\left|\dfrac{1}{2\sqrt{x}}\right|_{x=y^2}} = \frac{e^{-y^2}}{\dfrac{1}{2\sqrt{y^2}}}$$

$$\dfrac{1}{2\sqrt{y^2}} = \boxed{2ye^{-y^2}}$$

$$\boxed{f_Y(y) = 2ye^{-y^2}}$$

step ② $\dfrac{dy}{dx} = \dfrac{1}{2\sqrt{x}}$ $\underline{x > 0}$

✓ Step ① $\boxed{f_Y(y) = \dfrac{f_X(x)\big|_{x=\phi^{-1}(y)}}{\left|\dfrac{dy}{dx}\right|_{x=\phi^{-1}(y)}}}$

$f_X(x) =$ given

$y = \sqrt{\dfrac{f_X(x)}{}} \, , \, f_X(x)$

$f_X(x) \Rightarrow 2e^{2x} \quad x \geq 0 \qquad y = \sqrt{x} \qquad y = \sqrt[1/3]{f_X(x)}$

$\underleftarrow{\quad x \text{ is a Random variable}}$

one-one Function
Invertible function

$= \dfrac{\left(2e^{2x}\right)_{x=\phi^{-1}(y)}}{\dfrac{1}{2\sqrt{x}}\Big|_{x=\phi^{-1}(y)}}$

$x = y^2$

$y = \sqrt{x} \quad \underrightarrow{x>0}$

$x = y^2$

$= \dfrac{2e^{2y^2}}{\dfrac{1}{2\sqrt{y^2}}} = 2 \cdot 2y\, e^{2y^2} = 4y\, e^{2y^2}$

✓ don't Discuss — solution

prob →→ P & C
→ Equations X
→ Calculus
(basic Integration)

15-20 Days
→ Binary memory

✓ Time Bound Practice
✓ Mock TEST
✓ Topic — question Solved
(Practice)
✓ DPP →→ 50% → at least

50% { Teacher
group
Internet
Friends
Leave

{ workout
↳ Logic
Previous concept
fundamental
weekness

THANK - YOU