Discrete

PMF PXCX)

 $E[x] = \sum_{x} p_{x}(x)$

continuous

PDF fx(x)

 $E[x] = \int x f_x(x) dx$

$$f_{X}(x) = \begin{cases} \int_{0}^{1} a \leq x \leq b \\ \int_{0}^{1} a \leq x \leq b \end{cases}$$

$$E[x] = \iint_{-\infty} f_{x}(x) \approx dx$$

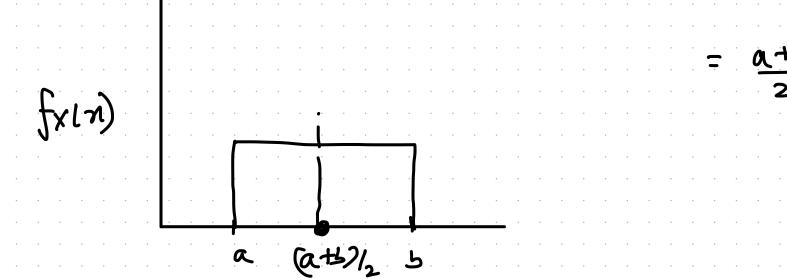
$$= \int_{C} f_{x}(x) dx$$

$$= \frac{1}{b-a} \cdot \frac{x^2}{2} \Big|_{a}$$

$$f_{X}(x) = \begin{cases} 1 & a \leq x \leq b \\ 5-a & old \end{cases}$$

$$E[x]=?$$

$$E[x] = \frac{1}{b-a} \cdot \frac{x^2}{2} \Big|_{b}$$



2) Emponential Riv. $f_{x}(x) = \begin{cases} \lambda e^{-\lambda x}, & x > 0 \end{cases}$

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ELXICA

2) Emponential Riv.

$$f_{x}(x) = \begin{cases} \lambda e^{-\lambda x}, & x > 0 \end{cases}$$

$$E[x]:?$$

$$= \int_{0}^{\infty} \lambda e^{-\lambda x} dx$$

2) Exponential Riv.
$$f_{x}(x) = \begin{cases} \lambda e^{-\lambda x}, & x > 0 \end{cases}$$

$$E[x]:?$$

$$= \begin{cases} \lambda e^{-\lambda z} & z dz \end{cases}$$

$$\int_{a}^{b} u \, dv = |vv|^{b} - \int_{a}^{b} v \, du \quad Integration by parts$$

2) Exponential Riv.

$$f_{x}(x) = \begin{cases} \lambda e^{-\lambda x}, & x > 0 \\ 0, & \text{old} \end{cases}$$

$$E[x]:?$$

$$= \begin{cases} \lambda e^{-\lambda x} & x dx \end{cases}$$

$$\int_{a}^{b} u \, dv = |v|^{b} - \int_{a}^{b} v \, du \quad \text{Integration by partix}$$

$$u=x \Rightarrow dx = dx$$

$$dy = \lambda e^{-\lambda x} dx \Rightarrow y = -e^{-\lambda x}$$

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$$\int_{a}^{b} u \, dv = uv \Big|_{a}^{b} - \int_{a}^{b} v \, du$$
Integration by partix

$$u=x \Rightarrow dx = dx$$

$$dv = \lambda e^{-\lambda x} dx \Rightarrow v = -e^{-\lambda x}$$

$$E[x] = -x e^{-\lambda x} = -x e^{-\lambda x}$$

$$e^{-\lambda x} = -x e^{-\lambda x} = -x e^{-\lambda x} = -x e^{-\lambda x}$$

$$= 0 + \int_{\mathcal{R}} -\lambda^{2} d\lambda$$

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$$E[x] = -x e^{-\lambda x} \Big|_{0}^{\infty} - \Big(-e^{-\lambda x}\Big). dx$$

$$= 0 + \int_{2}^{\infty} dx$$

$$= -\frac{1}{\lambda} \left[e^{-xx} - e^{0} \right] = \frac{1}{\lambda}$$

 $E[g(x)] = \begin{cases} g(x) \cdot f_x(x) dx \end{cases}$

$$E[g(x)] = \begin{cases} g(x) \cdot f_x(x) dx \\ g(x) \cdot f_x(x) dx \end{cases}$$

$$O) \text{ Find } E[x^2] = \begin{cases} x^2 & \text{div} \\ \frac{x^2}{b-a} & \text{div} \end{cases}$$

$$E[g(x)] = \begin{cases} g(x) \cdot f_x(x) dx \\ g(x) \cdot f_x(x) dx \end{cases}$$
o) Find
$$E[x^2] = \begin{cases} x - unif(a_1b) \\ \frac{x}{b-a} dx \end{cases}$$

$$= \begin{cases} x^2 \\ \frac{x}{b-a} \end{cases}$$

$$=\frac{x^{3}}{3(b-a)}\Big|_{a}^{b}=\frac{b^{3}-a^{3}}{3(b-a)}$$

$$= \frac{(b-a)(a^2+b^2+ab)}{2Cb-a}$$

VAC [X]:
$$E[X^2] - E[X]$$

$$= a^2 + b^2 + a^2 - \left(\frac{a+b}{2}\right)^2$$

$$= 3$$

$$=4a+4b^2+hab-3a^2-3b^2-6ab$$

$$=\frac{a^2+b^2-2ab}{12}=\frac{(a-b)}{12}$$

$$E[x] = \int_{2\pi 6^2} \sqrt{2\pi 6^2}$$

$$E[X] = \int_{\infty}^{\infty} dx \int_{0}^{\infty} \frac{-(x-\mu)^{2}}{26^{2}}$$

$$= \int_{-\infty}^{\infty} \sqrt{2\pi 6^{2}}$$

$$dy = dx$$

$$E[x] = \int_{-\infty}^{\infty} (y+\mu) \frac{1}{\sqrt{2\pi6^2}} \cdot e^{-\frac{x^2}{26^2}}$$

$$E[X] = \int_{\infty}^{\infty} \sqrt{2\pi 6^2}$$

$$-\infty$$

$$E[x] = \int_{-\infty}^{\infty} (y+\mu) \frac{1}{\sqrt{2\pi6^2}} \cdot e^{-\frac{y^2}{2}}$$

$$\frac{-0}{\sqrt{2\pi}6^{2}} = \frac{1}{\sqrt{2\pi}6^{2}} = \frac{1}{\sqrt{2\pi}6^{2}} + \frac{0}{\sqrt{2\pi}6^{2}} = \frac{1}{\sqrt{2\pi}6^{2}}$$

Show
$$E[x] = \mu$$

$$E[x] = \int_{-\infty}^{\infty} 2 \frac{1}{\sqrt{2\pi6^2}} \cdot e^{-\frac{1}{26^2}}$$

$$E[x] = \int_{-\infty}^{\infty} (y + \mu) \frac{1}{\sqrt{2\pi6^2}} \cdot e^{-\frac{1}{26^2}}$$

$$= \frac{1}{\sqrt{2\pi6^2}} \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi6^2}} + \mu \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi6^2}} \int_{-\infty}^{\infty} \int_$$

Show
$$E[x] = \mu$$

$$E[x] = \int_{-\infty}^{\infty} dx \frac{1}{\sqrt{2\pi6^2}} e^{-\frac{(x-\mu)^2}{2\delta^2}}$$

$$E[x] = \int_{-\infty}^{\infty} (y+\mu) \frac{1}{\sqrt{2\pi6^2}} e^{-\frac{y^2}{2\delta^2}}$$

$$= \frac{1}{\sqrt{2\pi6^2}} \int_{-\infty}^{\infty} \frac{y \cdot e^{-\frac{y^2}{2\delta^2}}}{\sqrt{2\pi6^2}} + \mu \int_{-\infty}^{\infty} \frac{e^{-\frac{y^2}{2\delta^2}}}{\sqrt{2\pi6^2}}$$

$$= D + \mu = \mu$$

Show $E[x] = \mu$

$$= \frac{(x-\mu)^2}{2\delta^2}$$

$$= \frac{1}{\sqrt{2\pi6^2}} \int_{-\infty}^{\infty} \frac{e^{-\frac{y^2}{2\delta^2}}}{\sqrt{2\pi6^2}} + \mu \int_{-\infty}^{\infty} \frac{e^{-\frac{y^2}{2\delta^2}}}{\sqrt{2\pi6^2}}$$

$$= D + \mu = \mu$$