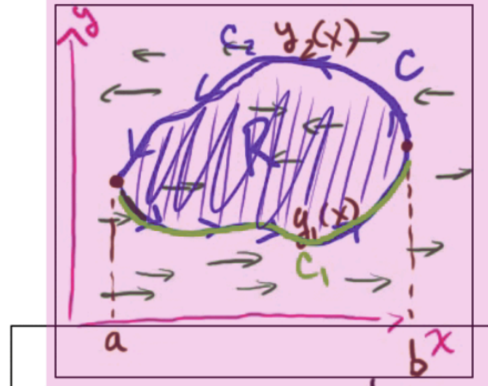

$\vec{F}(x,y) = P(x,y)\,\hat{\imath}$ $\quad d\vec{r} = dx\,\hat{\imath} + dy\,\hat{\jmath}$

$\oint_C \vec{F}\cdot d\vec{r}$

$d\vec{r} = \frac{dx}{dt}dt\,\hat{\imath} + \frac{dy}{dt}dt\,\hat{\jmath}$

$$\oint_C P(x,y)\,dx = \underbrace{\int_a^b P(x,y_1(x))\,dx}_{C_1} + \underbrace{\int_b^a P(x,y_2(x))\,dx}_{C_2}$$

$$= \int_a^b \big(P(x,y_1(x)) - P(x,y_2(x))\big)\,dx = -\int_a^b \big(P(x,y_2(x)) - P(x,y_1(x))\big)\,dx$$

$$= -\int_a^b P(x,y)\Big|_{y=y_1(x)}^{y=y_2(x)}\,dx = -\int_a^b \int_{y_1(x)}^{y_2(x)} \frac{\partial P}{\partial y}\,dy\,dx$$

$$\oint_C P(x,y)\,dx = -\iint_R \frac{\partial P}{\partial y}\,dy\,dx$$

Probability Lesson #22

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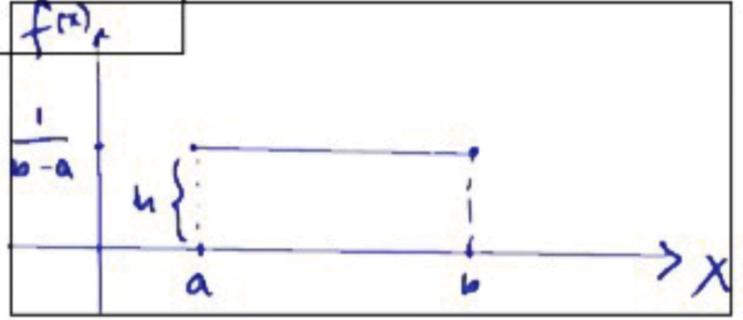
Uniform Distribution

$X \sim \mathrm{Unif}(a,b)$



$(b-a)h = 1$

$\Rightarrow h = \frac{1}{b-a}$

$$f_X(x) = \frac{1}{b-a}, \quad a \le x \le b$$

$$F(x) = \begin{cases} 0, & \text{if } x < a \\ \frac{x-a}{b-a}, & \text{if } a \le x \le b \\ 1, & \text{if } x > b \end{cases}$$

$; \quad E(X) = \frac{b+a}{2} \; ; \quad Var(X) = \frac{(b-a)^2}{12}$

$$M_X(t) = \frac{e^{bt} - e^{at}}{(b-a)t}$$

$$\frac{d}{dx}\left[\frac{x^{n+1}}{n+1} + C\right] = \frac{(n+1)x^n}{n+1} + 0 = x^n$$

$n \neq -1$

$$\underbrace{\int x^n\,dx}_{\text{indef. integral}} = \frac{x^{n+1}}{n+1} + C$$

$n \neq -1$

$$\int x^5\,dx = \frac{x^{5+1}}{5+1} + C = \frac{x^6}{6} + C$$

$$\int 5x^{-2}\,dx = 5\int x^{-2}\,dx = 5\left(\frac{x^{-2+1}}{-2+1} + C_1\right) = 5\left(\frac{x^{-1}}{-1} + C_1\right) = 5(-x^{-1} + C_1) = \boxed{-5x^{-1} + C}$$