$f(x)$ $\qquad x \to x + \delta x$

$$f(x+\delta x) = f(x) + f'(x)\,\delta x + \frac{1}{2} f''(x)\,\delta x^2 + O(\delta x^3)$$

$$df = f(x+\delta x) - f(x)$$

$$\frac{\partial f}{\partial x} = f_x$$

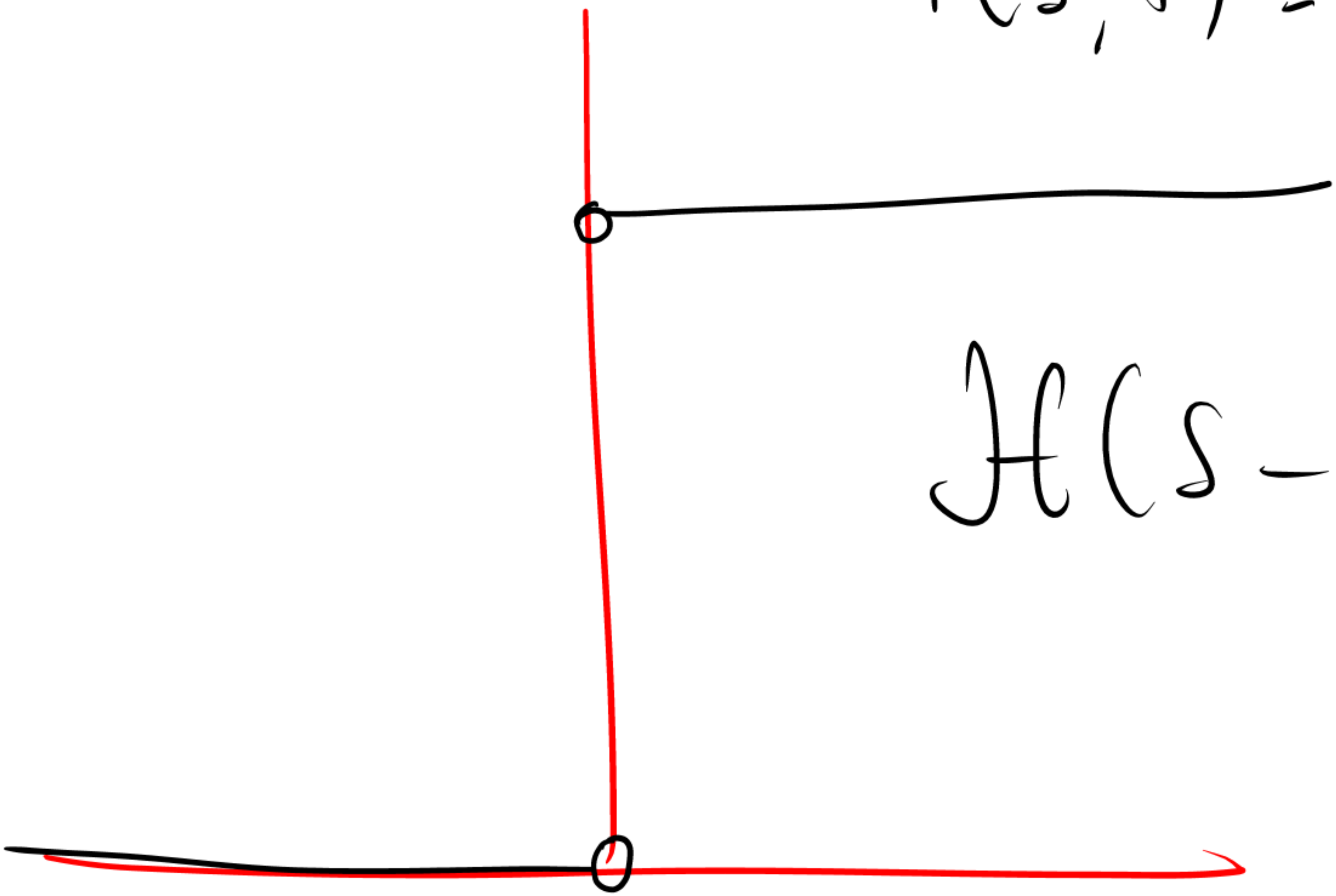
$$\boxed{f(x) = f_x}$$

$\log_{10}$

$\ln = \log_e$

$\ln \rightarrow \log$

Call $P(S,T) = \mathrm{Max}(S-\epsilon, 0)$



$$\mathcal{H}(S-\epsilon) = \begin{cases} 1 & S > \epsilon \\ 0 & S \leq \epsilon \end{cases}$$

$$\int_{-\infty}^{\infty} e^{-x^2}\,dx = \sqrt{\pi} \qquad \int_{-\infty}^{\infty} \equiv \int_{\mathbb{R}}$$

1 $$N(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{1}{2}s^2}\,ds$$

$x \longrightarrow \infty \qquad N(x) \longrightarrow 1 \qquad u = \frac{s}{\sqrt{2}}$

$$\int_{-\infty}^{\infty} e^{-\frac{1}{2}s^2}\,ds = \sqrt{2\pi} \qquad \sqrt{2}\,du = ds$$

$$\cancel{\sqrt{2}} \int_{\mathbb{R}} e^{-u^2}\,du = \sqrt{\cancel{2}\pi}$$

$$\int_{\mathbb{R}} e^{-u^2}\, du = \sqrt{\pi}$$

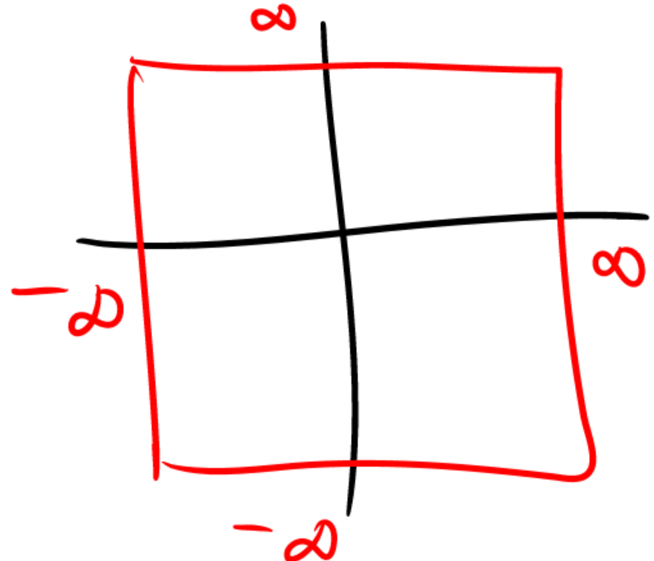
If $f(x)$ is even $\Rightarrow$

$$\int_{-a}^{a} f(x)\, dx = 2\int_{0}^{a} f(x)\, dx$$

$$\Rightarrow \int_{0}^{\infty} e^{-x^2}\, dx = \sqrt{\pi}/2$$

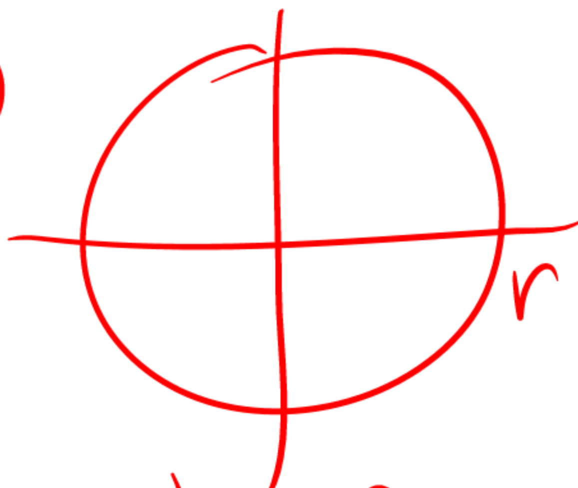
$$I = \int_{\mathbb{R}} e^{-x^2}\,dx \quad \therefore \quad I^2 = \underbrace{\int_{\mathbb{R}} e^{-x^2}\,dx}_{f(x)} \underbrace{\int_{\mathbb{R}} e^{-y^2}\,dy}_{f(y)}$$

$$(*)\quad I^2 = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} e^{-(x^2+y^2)}\,dx\,dy$$



$x = r\cos\theta$

$y = r\sin\theta$



$r \to \infty$

$dx\,dy \to r\,dr\,d\theta$

$$(*)\quad I^2 = \int_0^{2\pi} \boxed{\int_0^{\infty} e^{-r^2}\,r\,dr}\,d\theta$$

$$I^2 = \frac{1}{2}\int_0^{2\pi} d\theta = \frac{\theta}{2}\Big|_0^{2\pi} = \pi$$

$$\boxed{I = \sqrt{\pi} = \int_{-\infty}^{\infty} e^{-x^2}\,dx}$$

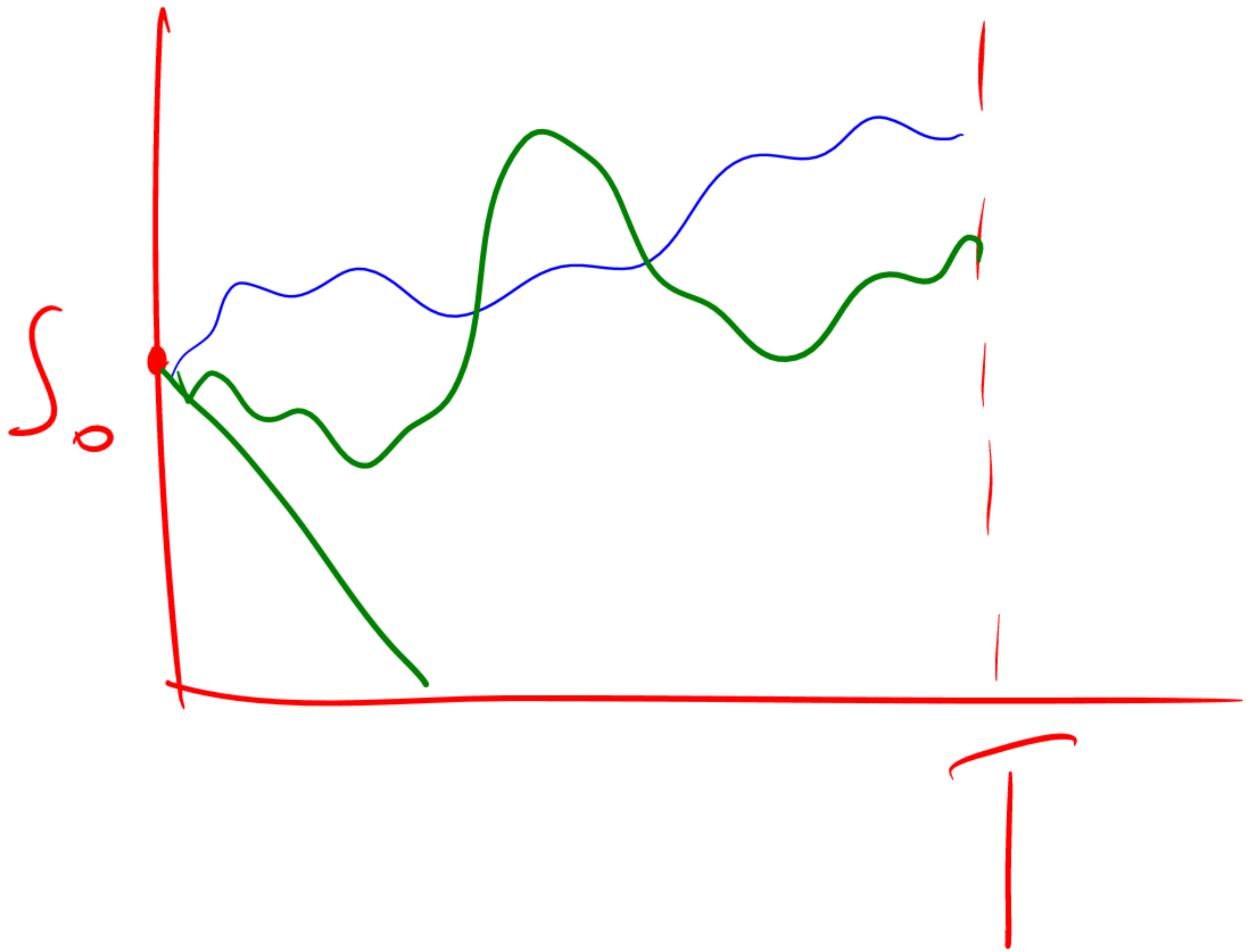
$$\frac{\mathbb{E}\left[(X-\mu)^3\right]}{\sigma^3}$$

Consider $\dfrac{dy}{dx} = f(x,y)$

If $f(x,y)$ homog ?

If yes then write $y = vx$

$\left(v = \dfrac{y}{x} \right)$


S_0
T

$$V(S, t; E, T; \mu, \sigma; r)$$

$$p(y, t\ ;\ y', t')$$

$$\delta y^2 / \delta t$$

1. $\delta y^2 \to 0$ quicker than δt

$\boxed{\text{zero}}$

2. $\delta t \to 0$ quicker than δy^2

blows up

3. $\dfrac{\delta y^2}{\delta t} \sim O(1)$ i.e. $\delta y^2 \sim O(\delta t)$

$\delta y \sim O(\sqrt{\delta t})$

$$p = t^{\alpha}\,\underbrace{f(\xi)}$$

R.V

$f(\xi) \longleftarrow$ pdf

p(s)
s

$$-\frac{1}{2}(\xi f)' = c^2 f'$$

$$c^2 \frac{df}{d\xi} = -\frac{1}{2}\xi f \rightarrow \int \frac{df}{f} = -\frac{1}{2c^2}\int \xi \, d\xi$$

$$\log f = -\frac{1}{4c^2}\xi^2 + C$$

$$f(\xi) = A e^{-\xi^2/4c^2}$$

$$\boxed{A = e^C}$$

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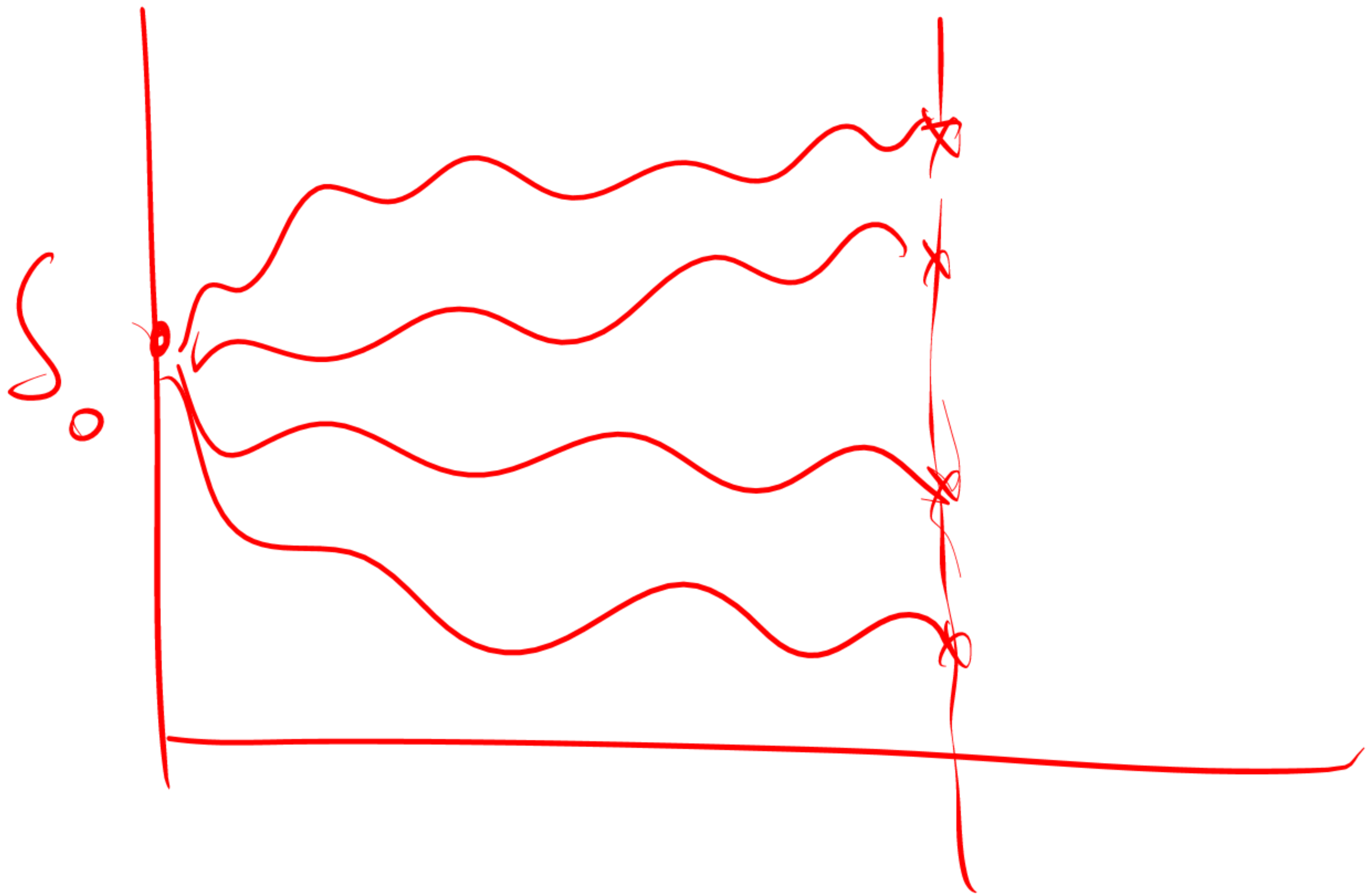
$O(\delta t)$ $\boxed{\delta y \sim \sqrt{\delta t}}$

$$\frac{\partial^2 p}{\partial y \, \partial t} \; \boxed{\delta y \, \delta t}$$

$O(\delta t^{3/2})$


S_0