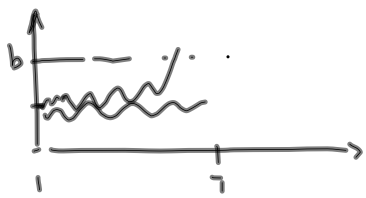

$$\iint f(y)\, \mathbb{1}_{(z<b)}\, \mathbb{P}(S_T \in dy, \bar{S}_T \in dz)$$

$$\cdots \iint \cdots \quad \mathbb{P}(X_T \in dx, \bar{X}_T \in du)$$

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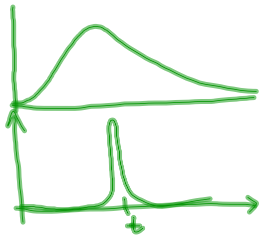
$\mathbb{P}(\bar{X}_t \in dy)$

$$\left[\, \mathbb{E}(e^{i\Theta \bar{X}_{e_q}}) = \int_0^\infty q e^{-qt}\, dt \cdot \int_{\mathbb{R}} e^{i\Theta x}\, \mathbb{P}(X_t \in dx) \right]$$

$e_1 \sim \exp(1)$

$\frac{1}{q} e_1 \sim \exp(q)$



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$$X_{e_q} = \underbrace{(X_{e_q} - \bar{X}_{e_q})}_{\stackrel{d}{=}\, \underline{X}_{e_q}} \oplus \bar{X}_{e_q}$$

$$X_{e_q} \stackrel{d}{=} S_q + I_q$$

$$S_q \perp\!\!\!\perp I_q$$

$S_q \stackrel{d}{=} \bar{X}_{e_q}$, $I_q \stackrel{d}{=} \underline{X}_{e_q}$

$$(\bar{X}_{e_q}, X_{e_q}) \stackrel{d}{=} (S_q, S_q + I_q)$$

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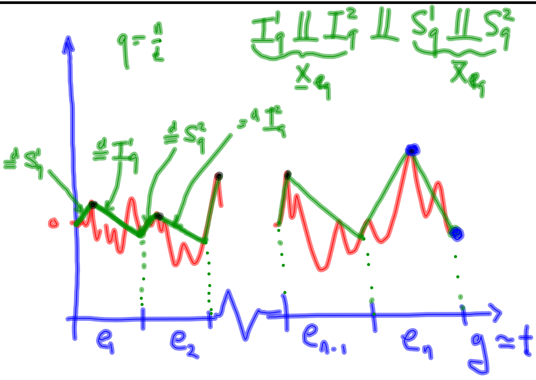
$q = \frac{n}{t}$

$$\underbrace{I_q^1 \perp\!\!\!\perp I_q^2}_{\underline{X}_{e_q}} \perp\!\!\!\perp \underbrace{S_q^1 \perp\!\!\!\perp S_q^2}_{\bar{X}_{e_q}}$$



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$q + \Psi$

$\frac{1}{q + \Psi}$

$$(\cdots\cdots\cdots)\left(\vdots\right) dx$$

$$\int_{\mathbb{R}} (1 - e^{i\Theta x} - ix\Theta)\, \Pi(dx) = \left(\sum_i a_i(\rho, \xi)\, \xi_i\, e^{\xi_i}\right) dx'$$

$$= \int_{(0,\infty)} \cdots \Pi(dx)\Big|_{(0,\infty)} + \int_{(-\infty,0)} \cdots \Pi(dx)\Big|_{(-\infty,0)}$$

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$$q + \overset{0}{\overset{\shortparallel}{\Psi}}(\Theta) = ia\Theta + \tfrac{1}{2}\sigma^2\Theta^2 + q + \text{stuff}(\Theta)$$

$$\text{stuff}(\Theta) = -\left(ia\Theta + \tfrac{1}{2}\sigma^2\Theta^2 + q\right)$$

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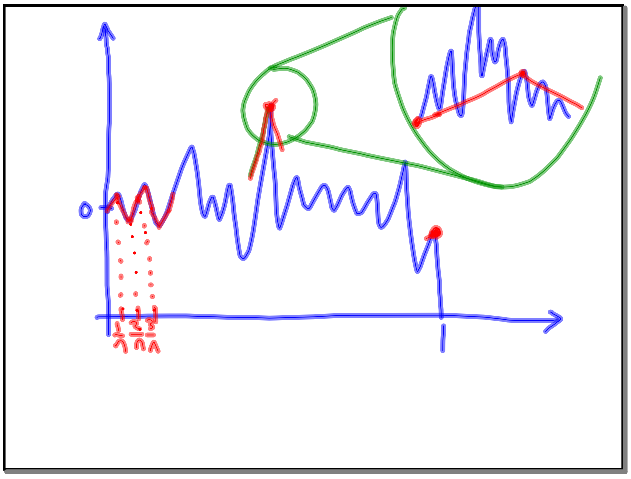

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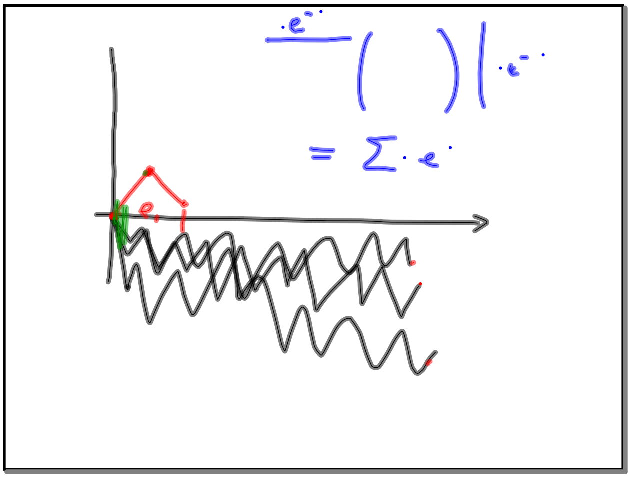

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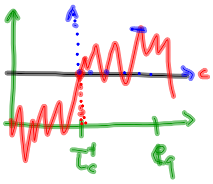
$q \geq 0, \beta \geq 0$

$\cdot\ \mathbb{E}\left(e^{-\beta \bar X_{e_q}} \mathbb{1}(\bar X_{e_q} > c)\right)$

$= \mathbb{E}\left(e^{-\beta \bar X_{e_q}} \mathbb{1}(\tau_c^+ < e_q)\right)$



on $\{\tau_c^+ < e_q\}$

$\bar X_{e_q} = X_{\tau_c^+} \oplus S_q$.

$S_q \perp\!\!\!\perp X_{\tau_c^+}$

$S_q \overset{d}{=} \bar X_{e_q}$

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$= \mathbb{E}\left(\mathbb{E}\left(e^{-\beta \bar X_{e_q}} 1(\tau_c^+ < e_q) \,\middle|\, \mathcal{F}_{\tau_c^+}\right)\right)$

$= \mathbb{E}\left(e^{-\beta X_{\tau_c^+}} 1(\tau_c^+ < e_q)\right) \mathbb{E}\left(e^{-\beta S_q}\right)$

$= \mathbb{E}\left(e^{-q\tau_c^+ - \beta X_{\tau_c^+}}\right) \mathbb{E}\left(e^{-\beta \bar X_{e_q}}\right)$

$\overline{\mathbb{E}\left(e^{-q\tau_c^+ - \beta X_{\tau_c^+}}\right)} = \dfrac{\mathbb{E}\left(e^{-\beta \bar X_{e_q}} 1(\bar X_{e_q} > c)\right)}{\mathbb{E}\left(e^{-\beta \bar X_{e_q}}\right)}$

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