~~Morh~~ Morphing ~~two LED~~ LED spectra

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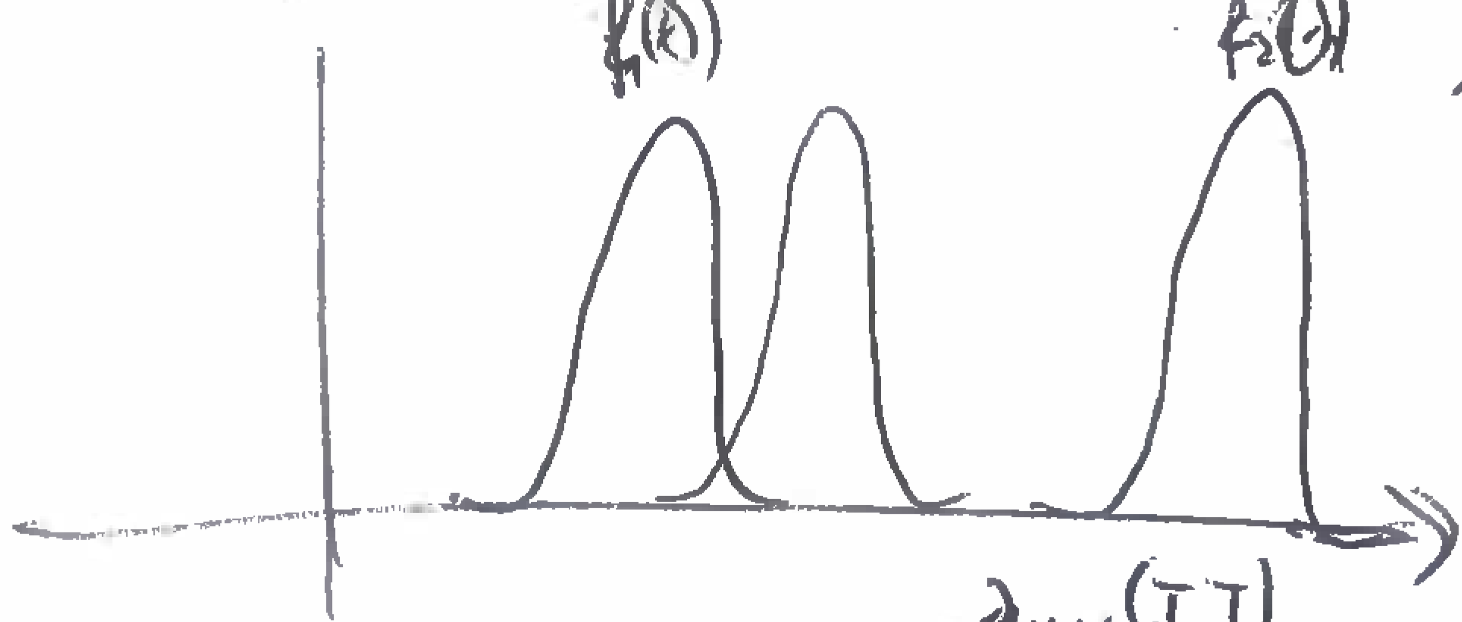


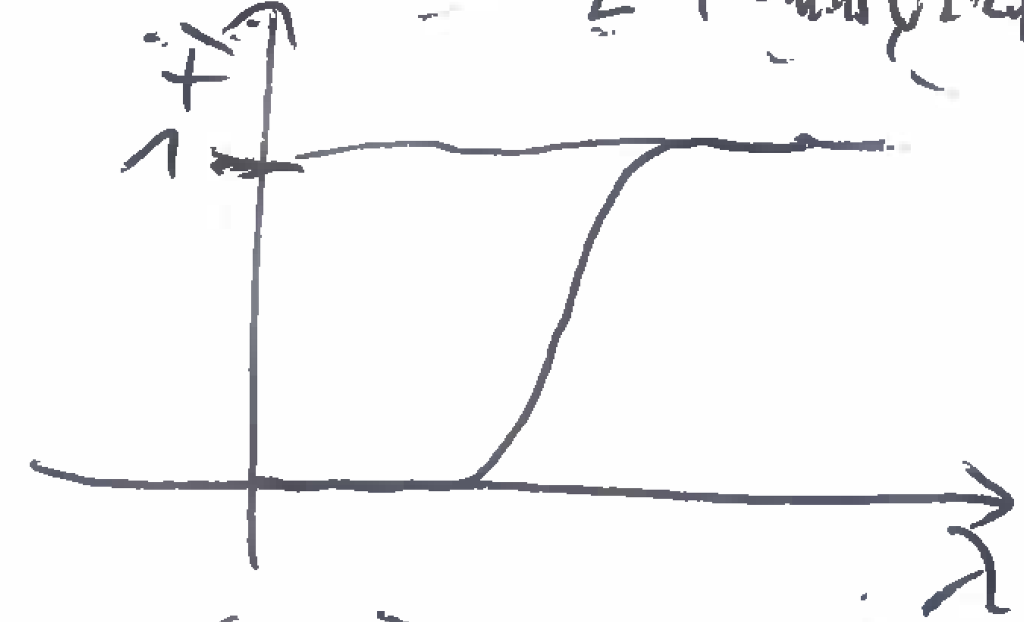
$f(\lambda, I, T)$ $\quad f$ continuous

$\lambda_{min}(I,T)$, $\lambda_{max}(I,T)$

$f(\lambda, I, T) > 0 \;\forall \lambda \in]\lambda_{min}, \lambda_{max}[$

~~$= 0 \;\forall \lambda \in [0, \lambda_{min}] \cup [\lambda_{max}, \infty[$~~

a) $\Phi(I,T) = \int_{\lambda_{min}(I,T)}^{\lambda_{max}(I,T)} f(\lambda, I, T)\, d\lambda$



b) $F(\lambda, I, T) = \int_{\lambda_{min}}^{\lambda} f(\lambda', I, T)\, d\lambda' \cdot \frac{1}{\Phi(I,T)}$,

$\lambda \in [\lambda_{min}(I,T), \lambda_{max}(I,T)]$

~~$F = 0 \quad \lambda < \lambda_{min}$~~
~~$\quad\; 1 \quad \lambda > \lambda_{min}$~~

F is continuous: $f(\lambda_{min}) = \int_{\lambda_{min}}^{\lambda_{min}} \dots = 0 \quad f(\lambda_{max}) = 1$

F is differentiable ~~& f~~ F' w.r.t. λ: $\frac{dF}{d\lambda}$ g ~~(λ, I, T)~~ $= \frac{dF}{d\lambda}(\lambda, I, T) = f(\lambda, I, T)$

F is strictly monotonous ascending: $\frac{dF}{d\lambda} > 0$

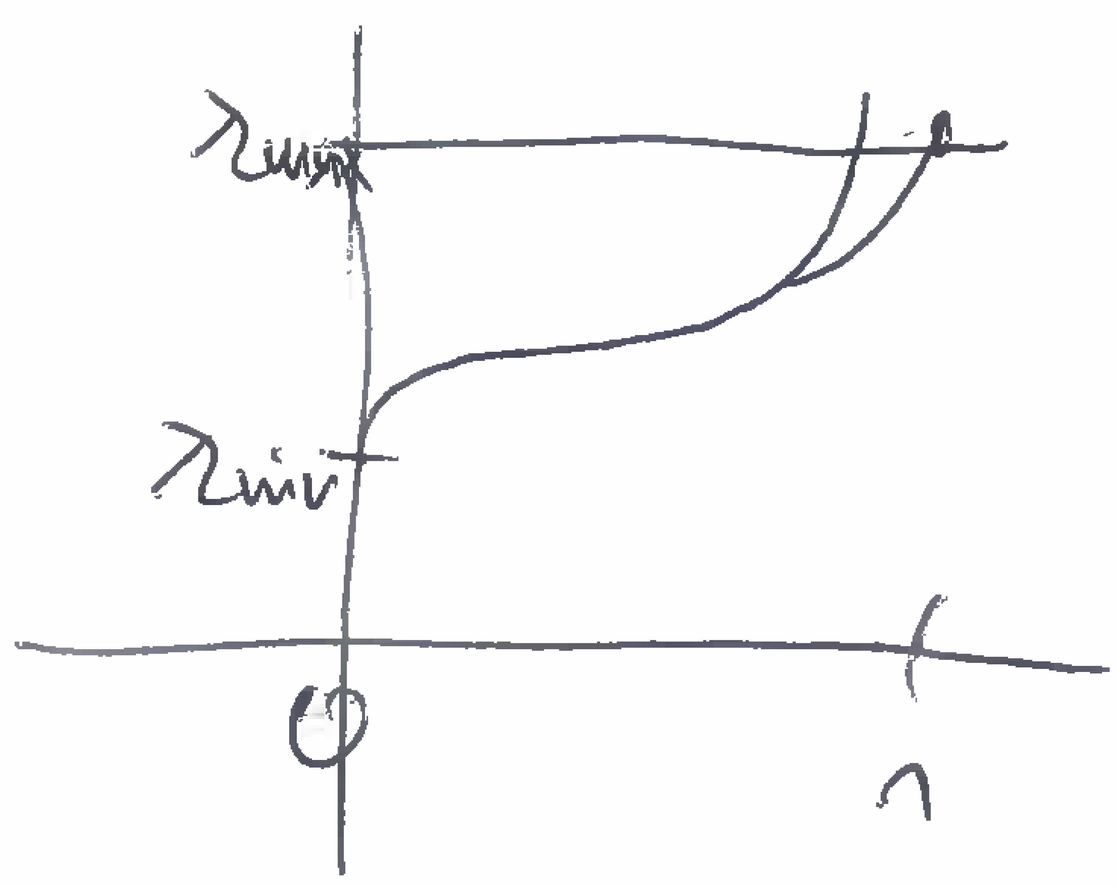
c) Inversion of F:

$G(x, I, T) = F^{-1}$: $F(\lambda, I, T) = x$, $\quad G(0, I, T) = \lambda_{min}(I,T)$

$x \in [0,1]$ $\quad G$

G is strictly mon.,

G is differentiable: $\frac{dG}{dx}(x, I, T) = \frac{1}{\frac{dF}{d\lambda}(G(x,I,T), I, T)}$



$= \frac{1}{f(G(x,I,T), I, T)}$

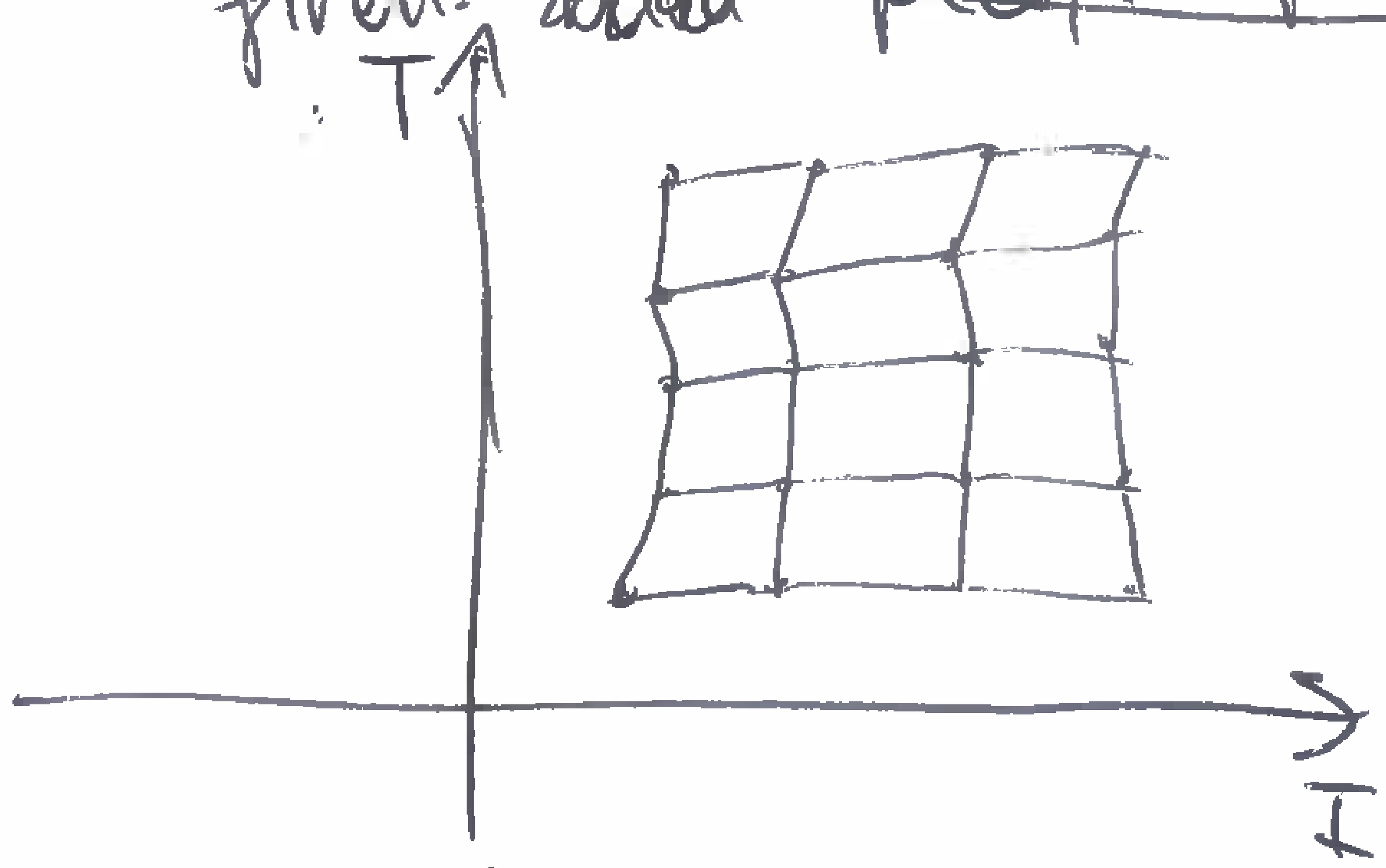
$= g(x, I, T)$

d) Return to f

$$G(x,I,T) \to \underset{=\frac{dG}{dx}}{g(x,I,T)} \to \underset{=\frac{1}{g}}{f(\overset{G(x,I,T)}{\downarrow},I,T)}$$

e) Morphing = Interpolating G

~~given: f(λ^{jk}_i, I_j, T_k)~~



I_{ij}, T_{ij}

λ^{ij}_k : strictly ascending
$k=1..n_{ij}$

$\lambda_{min}(I_{ij}, T_{ij}) = \lambda^{ij}_1$
$\lambda_{max} \qquad\qquad = \lambda^{ij}_{n_{ij}}$

f) For I, T:

- find ij such that $I_{ij} \le I < I_{i+1,j}$, $T_{ij} \le T < T_{i,j+1}$

$I = (1-u)(1-v) I_{ij} + u(1-v) I_{i+1,j} + (1-u)v I_{i,j+1} + uv I_{i+1,j+1}$

$T =$

$u, v =$ bilinearInverse

$\frac{I}{T}$ t ((1-

Example: $\cancel{f(x)}$ $f(\lambda, I, T) = \cancel{\Phi\, \varphi(I,T) \cdot \exp\left(-\frac{(\lambda - \lambda_0(I,T))^2}{2\sigma(I,T)}\right)}$

$$\frac{\Phi(I,T)}{\sigma(I,T)\sqrt{2\pi}} \exp\left(-\frac{1}{2}\left(\frac{\lambda - \lambda_0(I,T)}{\sigma(I,T)}\right)^2\right)$$

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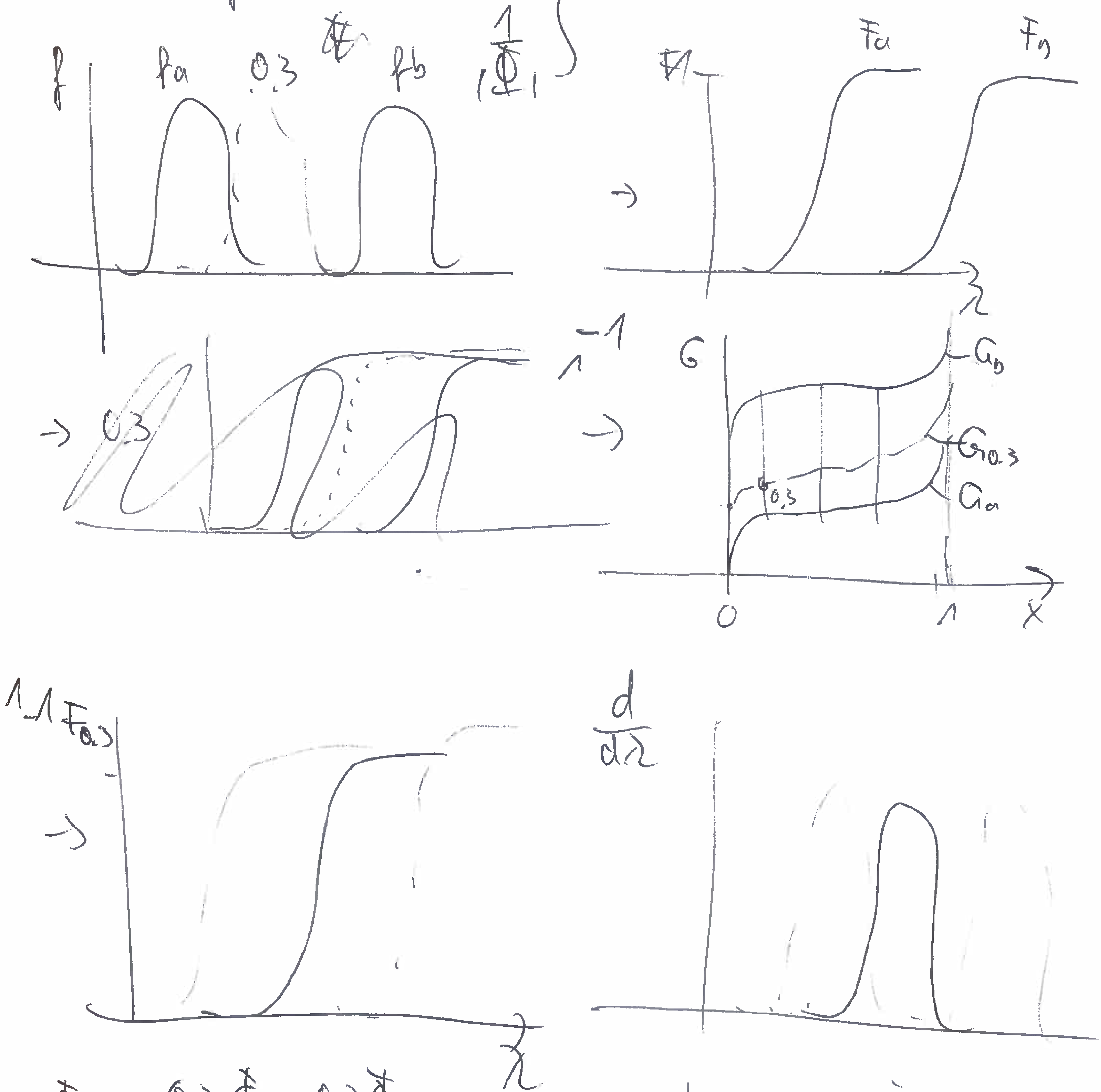
$\cancel{f(\lambda, I, T) =}$



$\Phi_{0.3} = 0.7\,\Phi_a + 0.3\,\Phi_b$