TAI8 : $E = \frac{-\hbar^2\alpha^2}{2m}$ et $\phi(x) = \begin{cases} Nxe^{-\alpha x} & \text{si } 0 \leq x \leq \infty \\ 0 & \text{ailleurs} \end{cases}$

3) Equa° de schrondjer :

$$\frac{-\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\Phi(x,t) + V(x,t)\Phi(x,t) = i\hbar\frac{\partial\Phi(x)}{\partial t}$$

$\Phi(x) \Rightarrow i\hbar\frac{d}{dt} = E$ donc $i\hbar\frac{\partial\Phi(x,t)}{\partial t} = E\Phi(x) = \frac{-\hbar^2\alpha^2}{2m}\Phi(x)$

$\frac{\partial\Phi(x)}{dt}$

$\frac{\Phi(x)}{dx} = Ne^{-\alpha x} - Nx\alpha e^{-\alpha x} = Ne^{-\alpha x}(1 - x\alpha)$

$\frac{\Phi(x)}{d^2x} = -N\alpha e^{-\alpha x} - N\alpha(e^{-\alpha x} - x\alpha e^{-\alpha x})$

$= -N\alpha e^{-\alpha x}(1 + 1 - \alpha x)$

$= -N\alpha e^{-\alpha x}(2 - \alpha x)$

$$V(x) = \left(i\hbar\frac{\partial\phi(x)}{dt} + \frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\Phi(x,t)\right) \times \frac{1}{\phi(x,t)}$$

$$V(x) = \frac{-\frac{\hbar^2\alpha^2}{2m}Nxe^{-\alpha x} + \frac{\hbar^2}{m}(-N\alpha e^{-\alpha x}(2-\alpha x))}{Nxe^{-\alpha x}}$$

$$V(x) = \frac{1}{x}\left(\frac{\hbar^2\alpha}{2m}(-\alpha x - 2 + \alpha x)\right) = -\frac{\hbar^2\alpha}{2m}$$

2/ $dP(x) = |\Phi(x)|^2 dx$

$= |N x e^{-\alpha x}|^2 dx$ ↙ dérivée

$= N^2 x^2 e^{-2\alpha x} dx$

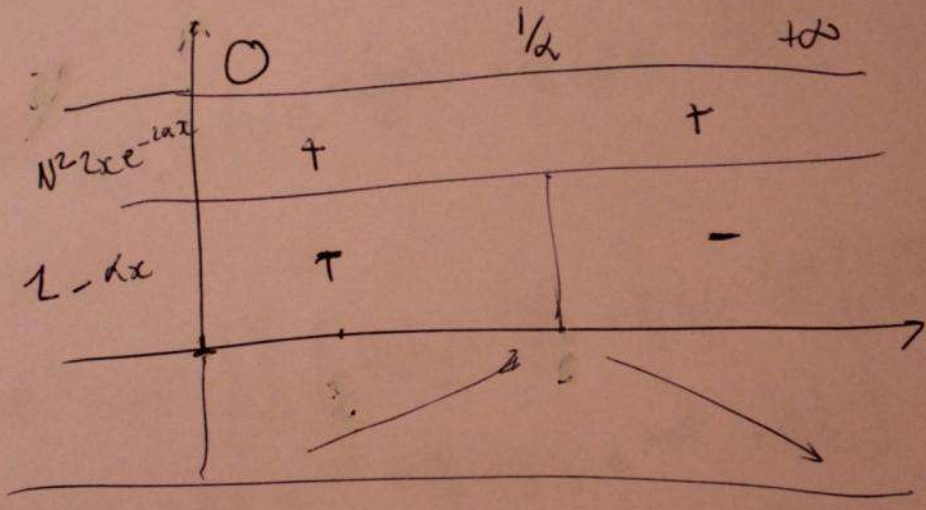
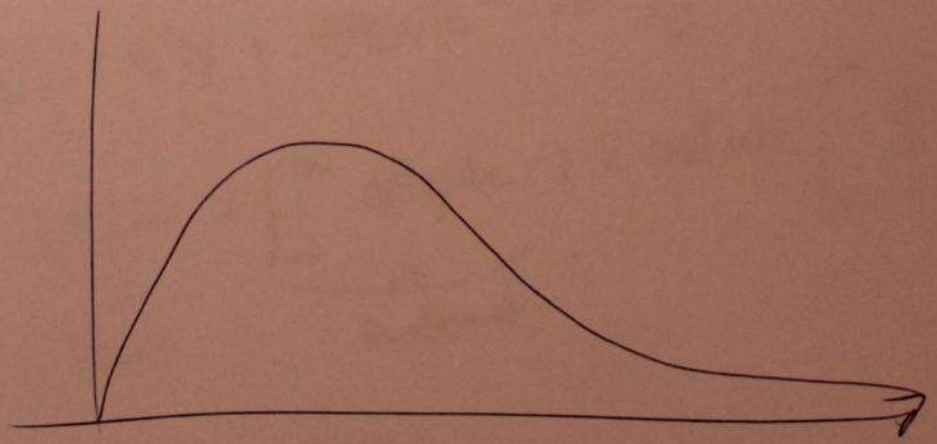
$= N^2 \left(2x e^{-2\alpha x} - 2x^2 \alpha e^{-2\alpha x} \right)$

$= N^2 2x e^{-2\alpha x} (1 - \alpha x)$

donc $dP(x) = 0 \Rightarrow x = 0$ ou $1 - \alpha x = 0$

$x = \frac{1}{\alpha}$

$x_{max} = \frac{1}{\alpha}$ car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