

$$\begin{aligned}
1 - \int_a^b |E(x, y)|^2 dx &= 1 - \int_a^b |\mathbf{E}_0|^2 |u(x, t)|^2 dx \\
&= 1 - |\mathbf{E}_0|^2 \int_a^b |u(x, t)|^2 dx \\
&= 1 - |\mathbf{E}_0|^2 \left(\frac{1}{2\pi} \right)^2 \int_a^b e^{-\frac{mwx^2}{\hbar}} \left(\frac{mw}{\pi\hbar} \right)^{\frac{1}{2}} e^{-\frac{mw}{2\hbar}x^2} dx \\
&= 1 - |\mathbf{E}_0|^2 \left(\frac{mw}{\pi\hbar} \right)^{\frac{1}{2}} \int_a^b e^{-\frac{mw}{\hbar}x^2} dx
\end{aligned}$$

For

$$V(x) = \frac{1}{2}m\omega^2x^2$$