We have to solve a hard & seemingly unsolvable integral:	$Q = \int_a^b \mathrm{f}(x)\,dx$
find (by trial & erorr): such that: and:	$\mathrm{g}(x,t)$ $\exists\tau\colon\ \mathrm{g}(x,\tau) = \mathrm{f}(x)$ $\frac{\partial}{\partial t}\mathrm{g}(x,t)$ is (easily?) integrable w.r.t. x
define: which implies:	$K(t) = \int_a^b \mathrm{g}(x,t)\,dx$ $K(\tau) = Q$ (precisely our target)
find a t^* for which we can find K without solving the integral in general:	$A = K(t^*)$
differentiate w.r.t. t & solve the easier integral:	$K'(t) = \frac{d}{dt}\int_a^b \mathrm{g}(x,t)\,dx = \int_a^b \frac{\partial}{\partial t}\mathrm{g}(x,t)\,dx$
hopefully, we can (easily?) find the primitive function thereof:	$\int K'(t)dt = L(t) + C$
solve the integration constant:	$C = A - L(t^*)$
FINAL RESULT:	$Q = L(\tau) + C$

There are some restrictions regarding the functions for which this works, but, being a physicist and not a mathemagician, I don't really care about such naughty things.

Isaacus Newtonus: Natura enim simplex est; *for nature is easy*.

Maybe *you* don't grasp it, but that's *your* ignorance.