

Quiz 1, January 13, 2015

Find $\frac{d}{dx} \int_0^{x^3} e^{-t} dt$.

Answer: Let $u = x^3$ and $y = \int_0^u e^{-t} dt$. The chain rule gives $\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx}$ and the Fundamental Theorem of calculus gives $\frac{dy}{du} = e^{-u}$. So

$$\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx} = e^{-u} 3x^2 = \boxed{3x^2 e^{-x^3}}.$$