

Daily ODE - 2/14/2022

Solve for $y(x)$: $\frac{dy}{dx} + 2xy = x$

Solution: Integrating Factor (already in standard form!)

$$p(x) = 2x$$

$$\int p(x) dx = x^2 + c \Rightarrow \mu(x) = e^{x^2}$$

Multiply: $\frac{d}{dx}(e^{x^2} \cdot y) = x e^{x^2}$

$$\Rightarrow e^{x^2} \cdot y = \int x e^{x^2} dx = \int e^u \frac{1}{2} du = \frac{1}{2} e^u + c = \frac{1}{2} e^{x^2} + c$$

↳ Substitution: $u = x^2$
 $du = 2x dx$
 $\frac{1}{2} du = x dx$

$$e^{x^2} \cdot y = \frac{1}{2} e^{x^2} + c$$

$$y = \frac{1}{2} + c e^{-x^2}$$