

$y' = 4x + y \Rightarrow y' + (-1)y = 4x$. $I(x) = e^{\int(-1)dx} = e^{-x}$. Multiplying by e^{-x} gives $e^{-x}y' - e^{-x}y = 4xe^{-x} \Rightarrow (e^{-x}y)' = 4xe^{-x} \Rightarrow e^{-x}y = 4 \int xe^{-x} dx = -4xe^{-x} - 4e^{-x} + C$ [integration by parts with $u = x$, $dv = e^{-x} dx$] $\Rightarrow y = -4x - 4 + Ce^x$. $y(0) = 2 \Rightarrow -4 + C = 2 \Rightarrow C = 6$, so $y = -4x - 4 + 6e^x$.