

W1L2 - INTRO TO INITIAL VALUE PROBLEMS

1. Verify
2. Solve for "C"
3. Re-write

EX $y' = 2y$; $y(x) = Ce^{2x}$, $y(0) = 3$ ↖ general solution
 $y' = 2Ce^{2x}$ ↪ Point (0,3)

$2Ce^{2x} = 2(Ce^{2x})$ ✓ \rightarrow verify

$y(x) = Ce^{2x} \Rightarrow y(0) = Ce^{2(0)} = 3$
 $C \cdot 1 = 3$
 $C = 3$

$y(x) = 3e^{2x} \rightarrow$ solve for C ↖ particular solution

EX $y' = x - y$; $y(x) = Ce^{-x} + x - 1$ ← general solution
 $y(0) = 10$

$y' = -Ce^{-x} + 1$

$-Ce^{-x} + 1 = x - [Ce^{-x} + x - 1]$
 $-Ce^{-x} + 1 = x - Ce^{-x} - x + 1$ ✓ \rightarrow verify

$y(x) = Ce^{-x} + x - 1$, $y(0) = 10$

$10 = Ce^{-0} + 0 - 1$

$10 = C - 1$

$11 = C$ $y(x) = 11e^{-x} + x - 1$

↖ particular solution

EX $e^y y' = 1$; $y(x) = \ln(x+C)$
 $y(0) = 0$

$y'(x) = \frac{1}{x+C}$

$e^{\ln(x+C)} \cdot \frac{1}{x+C} = 1$

$x+C \cdot \frac{1}{x+C} = 1$ ✓ \rightarrow verify

$y(x) = \ln(x+C)$ $y(0) = 0$

$0 = \ln(0+C)$

$0 = \ln(C)$ $e^0 = C \Rightarrow \underline{C=1}$

$y(x) = \ln(x+1)$