

Show all work, including mental steps, in a clearly organized way that speaks for itself. Use proper mathematical notation, identifying expressions by their proper symbols (introducing them if necessary), and use arrows and equal signs when appropriate. Always simplify expressions. BOX final short answers. LABEL parts of problem. Keep answers EXACT (but give decimal approximations for interpretation). Indicate where technology is used and what type (Maple, GC).

<p>1. $3 \frac{dy}{dx} + 6y - 9e^{-4x} = 0, y(0) = 5$</p> <p>a) Hand draw in the solution of this differential equation satisfying the initial condition on the associated direction field to the right. Put a circled dot at the point corresponding to the initial condition.</p> <p>b) Use the linear solution recipe to find the general solution of this differential equation. Simplify it and box it.</p> <p>c) Find the solution of this differential equation which satisfies the given initial condition. Simplify it and box it.</p> <p>d) Evaluate $y(1)$ numerically to 2 decimal places. Locate the point at $x = 1$ on your hand drawn curve with a squared dot. Is this consistent with your numerical result? Explain.</p>	
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► solution

a) see diagram

b) $\frac{1}{3} [3 \frac{dy}{dx} + 6y - 9e^{-4x} = 0]$

$\frac{dy}{dx} + 2y - 3e^{-4x} = 0$

$e^{2x} [\frac{dy}{dx} + 2y = 3e^{-4x}]$

$\int 2dx = 2x$

$\frac{d}{dx}(ye^{2x}) = 3e^{2x}e^{-4x} = 3e^{-2x}$

$ye^{2x} = \int 3e^{-2x} dx = 3 \frac{e^{-2x}}{-2} + C$

$y = e^{-2x} (-\frac{3}{2}e^{-2x} + C)$

$= -\frac{3}{2}e^{-4x} + Ce^{-2x}$ gen soln

c) $5 = y(0) = -\frac{3}{2} + C \rightarrow C = 5 + \frac{3}{2} = \frac{13}{2}$

$y = -\frac{3}{2}e^{-4x} + \frac{13}{2}e^{-2x}$ IVP soln

d) see diagram

$y(1) = -\frac{3}{2}e^{-4} + \frac{13}{2}e^{-2} \approx 0.8522058825 \approx 0.85$

clearly my penciled in first attempt veered up a bit along the way but given the rough grid, it is close enough to be consistent.

knowing the result I could retrace the curve to force it through the desired point, BUT that was not the point of this exercise.