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Q: What's Sir Model named after?

A: Susceptible Individuals, Infected individuals & Recovered Individuals

Q: Why is this property not true for $y'(t) - y(t)^2$?

A: I am unsure. I believe due to the nonhomogenous nature of the solution, it is not a general solution. It would result in a combined linear & nonlinear solution.

Q: $y''(t) - y'(t) + 8y = 0 \quad y(0) = 0 \quad y'(0) = 0 \quad y(t) = e^{rt}$

A: $r^2e^{rt} - re^{rt} + 8e^{rt} = 0 \rightarrow r^2 - r + 8 \quad \frac{1 \pm \sqrt{1-4(1)}}{2} \quad r = \frac{1}{2} \pm i\frac{\sqrt{31}}{2}$

$y = e^{\frac{1}{2}t}\left(C_1 \cos\left(\frac{\sqrt{31}}{2}t\right) + C_2 \sin\left(\frac{\sqrt{31}}{2}t\right)\right) = 0 \quad C_1 = 0$

$y' = \frac{1}{2}e^{\frac{1}{2}t} - \frac{\sqrt{31}}{2}C_2 \sin(\quad) + \frac{\sqrt{31}}{2}(C_2 \cos(\quad)) = 0 \quad C_2 = 0$

$y = 0$

Q: Why is the prop. that if $a(n)$ is a solution so is $C \cdot a(n)$ not valid for $a(n) = a(n-1)^2$.

A: The variable C is a linear value & for an exponentially recurring, recurrence, the value of $C \cdot a(n) \neq a(n-1)^2$ for all n.