Dynamical Systems Quiz-3

Instructions. Be sure to show your work so that it is clear how you got your answers. Simplify the answers!

- 1. Find the general solution of $\frac{dx}{dt} + 6x = 12$ This equation can be solved as linear or as separable. $(x = 2 + Ce^{-6t})$
- 2. Find the general solution of $\frac{dx}{dt} + 6x = 14e^t$ This equation can be solved using a formula for linear or by the undetermined coefficients method. $x = 2e^t + Ce^{-6t}$

Name .

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 $=t^{r}(r^{2}+3r+2)=0$

3. Find all solutions of the form t^r for $t^2x'' + 4tx' + 2x = 0$ If $x = t^r$ then $x' = rt^{r-1}$ and $x'' = r(r-1)t^{r-2}$. Putting these into the equation we get

 $t^{2}x'' + 4tx' + 2x = t^{2}r(r-1)t^{r-2} + 4trt^{r-1} + 2t^{r}$ $= r(r-1)t^{r} + 4rt^{r} + 2t^{r} = t^{r} (r(r-1) + 4r + 2)$

A quadratic equation to solve is $r^2 + 3r + 2 = 0$. There are two roots $r_1 = -2$ $r_2 = -1$ The general solution is $x = C_1 t^{-1} + C_2 t^{-2}$

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1. Find the general solution of $\frac{dx}{dt} + 7x = 28$ This equation can be solved as linear or as separable. Answer: $x = 4 + Ce^{-7t}$

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- 2. Find the general solution of $\frac{dx}{dt} + 7x = 24e^t$ This equation can be solved using a formula for linear or by the undetermined coefficients method. Answer: $\left(x = 3e^t + Ce^{-7t}\right)$
- 3. Find all solutions of the form t^r for $t^2x'' 2x = 0$ A quadratic equation to solve is $r^2 - r - 2 = 0$. There are two roots $r_1 = 2 r_2 = -1$ The general solution is $x = C_1 t^{-1} + C_2 t^2$

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- 1. Find the general solution of $\frac{dx}{dt} + 8x = 16$ This equation can be solved as linear or as separable. $\left(x = 2 + Ce^{-8t}\right)$
- 2. Find the general solution of $\frac{dx}{dt} + 8x = 27e^t$ This equation can be solved using a formula for linear or by the undetermined coefficients method. $\left(x = 3e^t + Ce^{-8t}\right)$

(turn the page for question 3)

3. Find all solutions of the form t^r for $t^2x'' + 2tx' - 2x = 0$ A quadratic equation to solve is $r^2 + r - 2 = 0$. There are two roots $r_1 = -2 r_2 = 1$ The general solution is $\left(x = C_1 t^{-2} + C_2 t^{-2}\right)$

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(turn the page for question 3)

C Key

B Key

A Key