Matthew Mendoza **Math-45-Krauel-F20**

Assignment Math45-Homework-WEEK-03 due 09/19/2020 at 11:59pm PDT

THEOREM

- $\frac{d}{dx}\sin(x)=\cos(x)$ • $\frac{d}{dx}\cos(x)=-\sin(x)$
- $\frac{d}{dx}\tan(x)=\sec^2(x)$ • $\frac{d}{dx}\sec(x)=\sec(x)\tan(x)$
- $\frac{d}{dx}\cot(x)=-\csc^2(x)$ • $\frac{d}{dx}\csc(x)=-\csc(x)\cot(x)$

Q1

Which of the following differential equations is $y = c_1\cos(t)+c_2\sin(t)$ a two-parameter family of solutions for?

$y=C_1\cos(t)+C_2\sin(t)$

- A. $y''+y=0$
- ~~B. $y''+y'+y=0$~~
- C. $y''-y=0$
- D. $y'+y=0$

$y'=[C_1\cos(t)]'+[C_2\sin(t)]'$
$=-C_1\sin(t)+C_2\cos(t)$

$y''=[C_1\cos(t)]''+[C_2\sin(t)]''$
$=[-C_1\sin(t)]'+[C_2\cos(t)]'$
$=-C_1\cos(t)+(-C_2\sin(t))$
$=C_1\cos(t)+C_2\sin(t)$

Answer(s) submitted:

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(incorrect)

Q2

Note that $x = ce^{-t}$ is a one-parameter solution for the differential equation $x'+x=0$. Which of the following is a solution to the first-order IVP consisting of the differential equation $x'+x=0$ and the initial condition $x(0)=7$.

Initial Value Problem

- A. $x=\frac{1}{7}e^{-t}$
- B. $x=7e^{-t+1}$
- C. $x=0$
- D. $x=7e^{-t}$

Answer(s) submitted:

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(incorrect)

Q3

$\frac{d}{dx}\sin(x)=\cos(x)$ $\frac{d}{dx}\cos(x)=-\sin(x)$

Note that $y=c_1\cos(-t)+c_2\sin(-t)$ is a two-parameter solution for the second-order differential equation $y''+y=0$. Which of the following is a solution to the second-order IVP consisting of the differential equation $y''+y=0$ and the initial condition $y(-\frac{\pi}{2})=2$, $y'(-\frac{\pi}{2})=3$.

$2=y(-\frac{\pi}{2})=C_1\cos(-(-\frac{\pi}{2}))+C_2\sin(-(-\frac{\pi}{2}))$
$2=C_1\cos(\pi/2)+C_2\sin(\pi/2)$
$2=C_1(1)+C_2(0)$
$C_1=2$

$y=C_1\cos(-t)+C_2\sin(-t)$
$\rightarrow 2\cos(-t)-3\sin(-t)$

$y'=[C_1\cos(-t)+C_2\sin(-t)]$
$=C_1(-\sin(-t)\cdot -1)+C_2(\cos(-t)\cdot -1)$
$=C_2\sin(-t)-C_2\cos(-t)$

$3=y'(-\pi/2)=C_1\sin(-t)-C_2\cos(-t)$
$3=C_1\sin(-(-\pi/2))-C_2\cos(-(-\pi/2))$
$3=C_1\sin(\pi/2)-C_2\cos(\pi/2)$
$3=C_1(0)-C_2(1)$
$C_2=-3$

- A. $y=3\cos(-t)-2\sin(-t)$
- B. $y=2\cos(-t)+3\sin(-t)$
- C. $y=3\cos(-t)+2\sin(-t)$
- D. $y=\cos(-2)+2\sin(-3)$

What is the largest integral I over which the solution from the previous part is defined?

- A. $(-\frac{\pi}{2},\infty)$
- B. $(-\infty,\infty)$
- C. $(-\infty,-\frac{\pi}{2})$

Answer(s) submitted:

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(incorrect)

Q4

Note that $y=\frac{1}{c+x}$ is a one-parameter solution for the differential equation $y'+y^2=0$. Which of the following is a solution to the first-order IVP consisting of the differential equation $y'+y^2=0$ and the initial condition $y(3)=\frac{1}{5}$.

$\frac{1}{5}=y(3)=\frac{1}{c+x}$

$\frac{1}{5}=\frac{1}{c+3}$

$\rightarrow \frac{c+3}{5}=1$

$c+3=5$

$c=2$

- A. $y=\frac{1}{5+x}$
- B. $y=\frac{1}{2+x}$
- C. $y=\frac{1}{3+x}$

- D. $y = \frac{1}{c+x} + 5$

Q4 What is the largest integral I over which the solution from the previous part is defined?

- A. $(-\infty, -2)$
- B. $(-\infty, \infty)$
- C. $(-2, \infty)$
- D. $(3, \infty)$

Answer(s) submitted:

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(incorrect)

Q5 Note that $y = c_1 e^x + c_2 e^{-x}$ is a two-parameter solution for the second-order differential equation $y'' - y = 0$. Which of the following is a solution to the second-order IVP consisting of the differential equation $y'' - y = 0$ and the initial condition $y(1) = 1$, $y'(1) = 2$.

- A. $y = \frac{3}{2}e^{x-1} - \frac{1}{2}e^{1-x}$
- B. $y = \frac{e}{2}e^x + \frac{1}{2}e^{-x}$

$y=C_1e^x+C_2e^{-x}$

$1=y(1)=C_1e^{(1)}+C_2e^{(-1)}$

$\rightarrow 1=C_1e^{(1)}+C_2e^{(-1)}$

$\rightarrow 1=C_1(2.718)+C_2(0.367)$

$y'=[C_1e^x+C_2e^{-x}]'$

$y'=C_1e^x-C_2e^{-x}$

$2=y'(1)=C_1e^x-C_2e^{-x}$

$2=C_1e^{(1)}-C_2e^{(-1)}$

- C. $y = e^x + 2e^{-x}$
- D. $y = \frac{3}{2}e^x - \frac{1}{2}e^x$

Q5 What is the largest integral I over which the solution from the previous part is defined?

- A. $(0, \infty)$
- B. $(-\infty, \infty)$
- C. $(-\infty, 0)$

Answer(s) submitted:

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(incorrect)

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6. (1 point) Note that $y = c_1 e^x + c_2 e^{-x}$ is a two-parameter solution for the second-order differential equation $y'' - y = 0$. Find values c_1 and c_2 so that y is a solution to the second-order IVP consisting of the differential equation $y'' - y = 0$ and the initial condition $y(0) = 3$, $y'(0) = 9$. The values are $c_1 =$ ____ and $c_2 =$ ____.

Answer(s) submitted:

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(incorrect)

$y''-y=0$

Solution $y=C_1e^x+C_2e^{-x} \leftarrow (1)$

given $y(0)=3$, $y'(0)=9$

when $y(0)=3$ from (1)

$3=C_1+C_2 \leftarrow (2)$

$y'(x)=C_1e^x-C_2e^{-x}$

$y'(0)=9$

$9=C_1-C_2 \leftarrow (3)$

Solve (2) & (3)

$C_1+C_2=3 \longrightarrow 6+C_2=3$

$C_1-C_2=9 \qquad C_2=-3$

$2c_1=12$

$C_1=6$ & $C_2=-3$