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NPTEL

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Courses » Ordinary and Partial Differential Equations and Applications

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Unit 4 - Week 3

Course outline

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Assignment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-09-05, 23:59 IST.

1) *The general solution of the linear system* ***1 point***

$$\frac{dx}{dt} = 3x - y, \quad \frac{dy}{dt} = 4x - y,$$

is

- $x = c_1e^t + c_2te^t,$
  $y = c_1e^t + c_2(2t-1)e^t$
- $x = c_1e^t + 2c_2te^t,$
  $y = 2c_1e^t + c_2(t-1)e^t$
- $x = c_1e^t + 2c_2te^t,$
  $y = 2c_1e^t + c_2(2t-1)e^t$
- $x = c_1e^t + c_2te^t,$
  $y = 2c_1e^t + c_2(2t-1)e^t$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$x = c_1e^t + c_2te^t,$
$y = 2c_1e^t + c_2(2t-1)e^t$

2) *The general solution of the linear system* ***1 point***

$$\frac{dx}{dt} = 5x + 4y, \quad \frac{dy}{dt} = -x + y,$$

is

- $x = 2c_1e^{3t} + c_2(2t+1)e^{3t},$
  $y = c_1e^{3t} + c_2e^{3t}$
- $x = -2c_1e^{3t} + c_2(t+1)e^{3t},$
  $y = c_1e^{3t} + c_2te^{3t}$
- $x = 2c_1e^{3t} + c_2(t+1)e^{3t},$
  $y = c_1e^{3t} - c_2te^{3t}$
- $x = -2c_1e^{3t} - c_2(2t+1)e^{3t},$
  $y = c_1e^{3t} + c_2te^{3t}$

No, the answer is incorrect.

The fundamental matrix of solution of

$$\frac{dx}{dt} = Ax = \begin{pmatrix} -7 & -9 & 9 \\ 3 & 5 & -3 \\ -3 & -3 & 5 \end{pmatrix} x,$$

is

- $\begin{pmatrix} 3e^{-t} & -e^{2t} & e^{2t} \\ e^{-t} & e^{2t} & 0 \\ -e^{-t} & 0 & -e^{2t} \end{pmatrix}$
- $\begin{pmatrix} 3e^{-t} & -e^{2t} & e^{2t} \\ -e^{-t} & e^{2t} & 0 \\ e^{-t} & 0 & e^{2t} \end{pmatrix}$
- $\begin{pmatrix} 3e^{-t} & -e^{2t} & e^{2t} \\ -e^{-t} & 2e^{2t} & 0 \\ e^{-t} & 0 & 2e^{2t} \end{pmatrix}$
- $\begin{pmatrix} -3e^{-t} & -e^{2t} & e^{2t} \\ -e^{-t} & 2e^{2t} & 0 \\ e^{-t} & 0 & e^{2t} \end{pmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\begin{pmatrix} 3e^{-t} & -e^{2t} & e^{2t} \\ -e^{-t} & e^{2t} & 0 \\ e^{-t} & 0 & e^{2t} \end{pmatrix}$

4) *The matrix* e^{tA} *for* ***1 point***

$$\frac{dx}{dt} = Ax = \begin{pmatrix} 5 & -4 \\ 2 & 1 \end{pmatrix} x$$

is

- $e^{3t}\begin{pmatrix} \cos 2t - \sin 2t & -2\sin 2t \\ -2\sin 2t & \cos 2t + \sin 2t \end{pmatrix}$
- $e^{3t}\begin{pmatrix} \cos 2t - \sin 2t & -2\sin 2t \\ -\sin 2t & \cos 2t + \sin 2t \end{pmatrix}$
- $e^{3t}\begin{pmatrix} \cos 2t + \sin 2t & 2\sin 2t \\ -\sin 2t & \cos 2t - \sin 2t \end{pmatrix}$
- $e^{3t}\begin{pmatrix} \cos 2t + \sin 2t & -2\sin 2t \\ \sin 2t & \cos 2t - \sin 2t \end{pmatrix}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$e^{3t}\begin{pmatrix} \cos 2t + \sin 2t & -2\sin 2t \\ \sin 2t & \cos 2t - \sin 2t \end{pmatrix}$

5) *The solution of* ***1 point***

$$\frac{dx}{dt} = Ax = \begin{pmatrix} -4 & 12 \\ -3 & 8 \end{pmatrix} x, \; x(0) = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$$

is given by

- $x(t) = \begin{pmatrix} 5e^{2t} - 42te^{2t} \\ -e^{2t} + 21te^{2t} \end{pmatrix}$
- $x(t) = \begin{pmatrix} 5e^{2t} + 42te^{2t} \\ -e^{2t} + 21te^{2t} \end{pmatrix}$
- $x(t) = \begin{pmatrix} 5e^{2t} - 42te^{2t} \\ -e^{2t} - 21te^{2t} \end{pmatrix}$

$$x(t) = \begin{pmatrix} 5e^{2t} + 42te^{2t} \\ -e^{2t} - 21te^{2t} \end{pmatrix}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$x(t) = \begin{pmatrix} 5e^{2t} - 42te^{2t} \\ -e^{2t} - 21te^{2t} \end{pmatrix}$$

6) *The solution of the non − homogeneous system* **0 points**

$$\frac{dx}{dt} = \begin{pmatrix} 1 & 2 \\ 4 & -1 \end{pmatrix} x + \begin{pmatrix} e^{-2t} \\ 0 \end{pmatrix}$$

is

$$x_1 = c_1 e^{3t} + c_2 e^{-3t} + \frac{1}{5} e^{-2t},$$
$$x_2 = c_1 e^{3t} - 2c_2 e^{-3t} - \frac{7}{10} e^{-2t}$$

$$x_1 = c_1 e^{3t} + c_2 e^{-3t} + \frac{1}{5} e^{-2t},$$
$$x_2 = c_1 e^{3t} + c_2 e^{-3t} - \frac{7}{10} e^{-2t}$$

$$x_1 = c_1 e^{3t} - c_2 e^{-3t} + \frac{1}{5} e^{-2t},$$
$$x_2 = c_1 e^{3t} + 2c_2 e^{-3t} - \frac{7}{10} e^{-2t}$$

$$x_1 = c_1 e^{3t} - 2c_2 e^{-3t} + e^{-2t},$$
$$x_2 = c_1 e^{3t} - c_2 e^{-3t} + \frac{7}{10} e^{-2t}$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$x_1 = c_1 e^{3t} + c_2 e^{-3t} + \frac{1}{5} e^{-2t},$$
$$x_2 = c_1 e^{3t} - 2c_2 e^{-3t} - \frac{7}{10} e^{-2t}$$

7) *The solution of the non − homogeneous system* **1 point**

$$\frac{dx}{dt} = \begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix} x + \begin{pmatrix} e^{t} \\ -e^{t} \end{pmatrix}$$

is given by

$$x_1 = -c_1 e^{t} + c_2 e^{t} + te^{t},$$
$$x_2 = c_1 e^{t} + c_2 te^{t} + e^{t}(t^2 - t)$$

$$x_1 = -c_1 e^{t} - c_2 e^{t} + te^{t},$$
$$x_2 = c_1 e^{t} - c_2 te^{t} + e^{t}(\tfrac{1}{2} t^2 - t)$$

$$x_1 = c_2 e^{t} + te^{t},$$
$$x_2 = c_1 e^{t} + c_2 te^{t} + e^{t}(\tfrac{1}{2} t^2 - t)$$

$$x_1 = c_2 e^{t} - te^{t},$$
$$x_2 = c_1 e^{t} + c_2 te^{t} + e^{t}(\tfrac{1}{2} t^2 - t)$$

No, the answer is incorrect.
Score: 0

Accepted Answers:

$$x_1 = c_2 e^{t} + te^{t},$$
$$x_2 = c_1 e^{t} + c_2 te^{t} + e^{t}(\tfrac{1}{2} t^2 - t)$$

8) **1 point**

$The\ set\ of\ ordinary\ points\ of\ the\ differential\ equations$
$(1-x^2)y'' + x^2y' + xy = 0$
is

- $\mathbb{R}$
- $\mathbb{R} - \{-1, 1\}$
- $\mathbb{R} - \{-1\}$
- $\mathbb{R} - \{1\}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$\mathbb{R} - \{-1, 1\}$

9) $The\ interval\ of\ convergence\ for\ the\ power\ series$ **1 point**

$\sum_{n=1}^{\infty} \frac{x^{2n}}{(-3)^n}$
is

- $-\sqrt{3} \leq x < \sqrt{3}$
- $-\sqrt{3} < x \leq \sqrt{3}$
- $-\sqrt{3} < x < \sqrt{3}$
- $-\sqrt{3} \leq x \leq \sqrt{3}$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$-\sqrt{3} < x < \sqrt{3}$

10) $The\ radius\ of\ convergence\ of\ the\ power\ series$ **1 point**

$\sum_{n=0}^{\infty} \frac{n!(5x+3)^n}{(n+1)^2+4n}$
is

- 1
- 0
- $\frac{3}{5}$
- ∞

No, the answer is incorrect.
Score: 0

Accepted Answers:
0

11) $The\ power\ series\ solution\ of\ the\ differential\ equation$ **1 point**

$y'' + xy' + y = 0$
$about\ x = 1\ is\ given\ by$

- $y(x) = a_0(1-(x-1)^2+(x-1)^3+(x-1)^4+\ldots)+a_1(x-\frac{1}{2}(x-1)^2-\frac{1}{6}(x-1)^3+\frac{1}{6}(x-1)^4+\ldots$
- $y(x) = a_0(1-\frac{1}{2}(x-1)^2+\frac{1}{6}(x-1)^3+\frac{1}{12}(x-1)^4+\ldots)+a_1(x-\frac{1}{2}(x-1)^2-\frac{1}{6}(x-1)^3+\frac{1}{6}(x-1$
- $y(x) = a_0(1+\frac{1}{2}(x-1)^2-\frac{1}{6}(x-1)^3+\frac{1}{12}(x-1)^4+\ldots)+a_1(x+\frac{1}{2}(x-1)^2+\frac{1}{6}(x-1)^3+\frac{1}{6}(x-1$
-

$y(x) = a_0(1 - \frac{1}{2}(x-1)^2 + \frac{1}{6}(x-1)^3 - \frac{1}{12}(x-1)^4 + \ldots) + a_1(x + \frac{1}{2}(x-1)^2 - \frac{1}{6}(x-1)^3 + \frac{1}{6}(x - 1$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$y(x) = a_0(1 - \frac{1}{2}(x-1)^2 + \frac{1}{6}(x-1)^3 + \frac{1}{12}(x-1)^4 + \ldots) + a_1(x - \frac{1}{2}(x-1)^2 - \frac{1}{6}(x-1)^3 + \frac{1}{6}(x-1)^4$

12) *The power series solution of the initial value problem* **0 points**

$y'' - xy = 0,\ y(0) = 1,\ y'(0) = 2$

is given by

- $y(x) = 1 + 2x + 3x^2 + 4x^3 + 5x^4 + \ldots$
- $y(x) = 1 + 2x + \frac{1}{3}x^3 + \frac{1}{6}x^4 + \frac{1}{180}x^6 + \frac{1}{252}x^7 + \ldots$
- $y(x) = 1 + 2x - \frac{1}{6}x^4 + \frac{1}{180}x^6 + \frac{1}{252}x^7 + \ldots$
- $y(x) = 1 + 2x + \frac{1}{6}x^4 + \frac{1}{180}x^6 + \frac{1}{252}x^7 + \ldots$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$y(x) = 1 + 2x + \frac{1}{6}x^4 + \frac{1}{180}x^6 + \frac{1}{252}x^7 + \ldots$

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