
Suppose $y_1 = \sin(x)$ and $y_2 = \cos(x)$ are solutions to a homogeneous linear differential equation $F(x, y, y', y'') = 0$. Which of the following best reflects what are additional solutions for the differential equation?

- A. $y = 2\sin(x) - 3\cos(x)$
- B. All of the functions listed here.
- C. $y = -3\cos(x) - \pi\sin(x)$
- D. $y = \sqrt{2}\sin(x) + 3\cos(x)$

Solution:
SOLUTION:
The correct answer is B.
Correct Answers:

- B

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2. (1 point) Select the following pairs of functions that are linearly independent.

- A. $y_1 = 9x$, $y_2 = x$
- B. $y_1 = \cos(x)$, $y_2 = \sin(x)$
- C. $y_1 = 1$, $y_2 = x$
- D. $y_1 = e^x$, $y_2 = 5e^x$
- E. $y_1 = e^x$, $y_2 = e^{-x}$
- F. $y_1 = \sin(x)$, $y_2 = -\sin(x)$
- G. None of the above

Solution:
SOLUTION:
The correct answer is BCE.
Correct Answers:

- BCE

Suppose $F(x, y, y', y'', \ldots, y^{(8)}) = 0$ an order 8 linear differential equation. Which of the following statements is NOT true, regarding a fundamental set of solutions for the DE?

- A. That the functions in the set are linearly independent.
- B. That any of the functions multiplied together form another solution.
- C. That the set must consit of 8 functions..
- D. That the functions in the set are all solutions.

Solution:
SOLUTION:
The correct answer is B.
Correct Answers:

- B

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4. (1 point) Suppose $y_1 = e^{5x}$ and $y_2 = e^{2x}$ are solutions to a homogeneous linear differential equation. Use the Wronskian to show that the solutions are linearly independent.

Wronskian = $\det\begin{bmatrix} \_\_\_\_ & \_\_\_\_ \\ \_\_\_\_ & \_\_\_\_ \end{bmatrix}$ = _____

These solutions are linearly independent because the Wronskian is [Choose/zero/nonzero] for all x.
Correct Answers:

- `<table border='0' cellspacing='10'>`
  `<tr><td> e^(5*x) </td><td> e^(2*x) </td></tr>`
  `<tr><td> 5*e^(5*x) </td><td> 2*e^(2*x) </td></tr>`
  `</table>`
- `e^(5*x)*2*e^(2*x)-e^(2*x)*5*e^(5*x)`
- `nonzero`

It can be shown that $y_1 = e^{-3x}$ and $y_2 = xe^{-3x}$ are solutions to the differential equation $y'' + 6y' + 9y = 0$ on $(-\infty, \infty)$.
What does the Wronskian of y_1, y_2 equal on $(-\infty, \infty)$?
$W(y_1, y_2)$ = _____ on $(-\infty, \infty)$.

? 1. Is $\{y_1, y_2\}$ a fundamental set for $y'' + 6y' + 9y = 0$ on $(-\infty, \infty)$?

Correct Answers:

- `e^(-3*x)*[e^(-3*x)-3*x*e^(-3*x)*ln(e)]+x*e^(-3*x)*3*e^(-3*x)*ln(e)`
- `YES`

Suppose $y = c_1 y_1 + \cdots + c_n y_n$ a general solution for a homogeneous linear differential equation of order 4. Which of the following statements is NOT true, regarding the functions $y_1, \ldots, y_n$?

- A. That any two of the functions multiplied together are again a solution.
- B. That the functions are linearly independent.
- C. That $n = 4$.
- D. That the functions are all solutions of the DE.

Solution:
SOLUTION:
The correct answer is A.
Correct Answers:

- `A`