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Following the method performed in the videos, to solve the differential equation  $7y'' + 7y' + 4y = 0$  we would first plug in which of the following functions?

- A.  $y = e^{mx}$
- B.  $y = x^m$
- C.  $y = 7x^2 + 7x + 4$
- D.  $y = \cos(mx)$
- E.  $y = \sin(mx)$

**Solution:**

SOLUTION:

The correct answer is A.

*Correct Answers:*

- A

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Following the method performed in the videos to solve  $6y'' + 2y' + 7y = 0$ , we seek find the  $m$  satisfying which of the following expressions?

- A.  $6m^2 + 2m + 7 = 0$
- B.  $5m^2 + 6m + 7 = 0$
- C.  $m = 6$
- D.  $(m - 6)(m - 2) = 0$

**Solution:**

SOLUTION:

The correct answer is A.

*Correct Answers:*

- A

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3. (1 point) Mark all of the possibilities that can arise when solving a quadratic equation as in the method of solving order 2 homogeneous linear differential equations.

- A. One repeated real root.
- B. No roots.
- C. Two complex roots.
- D. One complex root.
- E. One real root and one complex root.
- F. Two distinct real roots.
- G. None of the above

**Solution:**

SOLUTION:

The correct answer is ACF.

*Correct Answers:*

- ACF

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Consider the differential equation  $y'' + 10y' + 34y = 0$ . Note that the methods described in the videos give rise to the two values  $m_1 = 5 + i3$  and  $m_2 = 5 - i3$ . Which of the following is the general solution to the differential equation?

- A.  $y = c_1 e^{5x} \cos(3x) + c_2 e^{5x} \sin(3x)$
- B.  $y = c_1 e^{5x} + c_2 e^{3x}$
- C.  $y = c_1 e^{(5+i3)x} + c_2 x e^{(5+i3)x}$
- D.  $y = c e^{5x} (\cos(3x) + \sin(3x))$

**Solution:**

SOLUTION:

The correct answer is A.

Correct Answers:

- A

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5. (1 point) Find the general solution to  $5y'' + 5y' - 10y = 0$ . Enter your answer as  $y = \dots$ . In your answer, use  $c_1$  and  $c_2$  to denote arbitrary constants and  $x$  the independent variable. Enter  $c_1$  as  $c1$  and  $c_2$  as  $c2$ .

\_\_\_\_\_ help (equations)

Correct Answers:

- $y = c1 * e^x + c2 * e^{-2x}$

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6. (1 point) The general solution to the second-order differential equation  $9y'' + 24y' + 16y = 0$  is in the form  $y(x) = c_1 e^{rx} + c_2 x e^{rx}$ . Find the value of  $r$ .

Answer:  $r =$  \_\_\_\_\_

Correct Answers:

- $-4/3$

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7. (1 point) Mark all of the differential equations below that are homogeneous linear differential equations with constant coefficients.

- A.  $6y'' + 9y' + 9y = 0$
- B.  $7y'' + 4y' + 9y = 4x^2$
- C.  $2y'' + 4y = 0$
- D.  $7y'' + 9y' + 4y = 0$
- E.  $9y'' + 6y' = 0$

- F.  $4y'' + 4y' + 9y = 0$

- G.  $6y'' + 9y' + 9y = e^{4x}$

- H. None of the above

**Solution:**

SOLUTION:

The correct answer is ACDEF.

Correct Answers:

- ACDEF

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Which of the followings is the solution to the differential equation  $y^{(4)} - 24y''' + 206y'' - 744y' + 945y = 0$ ? (You may use something like WolframAlpha to find the roots of the polynomial!)

- A.  $y = c_1 e^{3x} (\cos(5x) + c_2 e^{3x} \sin(5x) + c_3 e^{7x} + c_4 e^{9x})$
- B.  $y = c_1 e^{3x} + c_2 e^{5x} + c_3 e^{7x} + c_4 e^{9x}$
- C.  $y = c_1 e^{3x} + c_2 e^{5x} + c_3 x^2 e^{7x} + c_4 x^3 e^{7x}$
- D.  $y = c_1 e^{3x} + c_2 x e^{3x} + c_3 x^2 e^{3x} + c_4 x^3 e^{3x}$

**Solution:**

SOLUTION:

The correct answer is B.

Correct Answers:

- B