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

Assignment Math45-Module-12-Exercises due 10/29/2020 at 11:59pm PDT

Q1 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. $y = \sin(mx)$

Q2 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. $(m-6)(m-2) = 0$

Q **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.

Q3

- 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

Q4 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. $y = ce^{5x}(\cos(3x) + \sin(3x))$

Q **5.** (1 point) Find the general solution to $5y'' + 5y' - 10y = 0$. Enter your answer as $y = \ldots$. 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.

$y = c_1 e^{x} + c_2 e^{-2x}$ help (equations)

Q **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: $r =$ $-4/3$

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

- A. $6y'' + 9y' + 9y = 0$

Q7

- 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

Q8 Which of the followins 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!)

Q8

- A. $y = c_1e^{3x}\left(\cos(5x) + c_2e^{3x}\sin(5x) + c_3e^{7x} + c_4e^{9x}\right)$
- B. $y = c_1e^{3x} + c_2e^{5x} + c_3e^{7x} + c_4e^{9x}$
- C. $y = c_1e^{3x} + c_2e^{5x} + c_3x^2e^{7x} + c_4x^3e^{7x}$
- D. $y = c_1e^{3x} + c_2xe^{3x} + c_3x^2e^{3x} + c_4x^3e^{3x}$

9. (1 point)
Enter a value for π
_____

Question 5

$5y'' + 5y' - 10y = 0$
Plug into DE; $y' = me^{mx}$
Gives $5m^2e^{mx} + 5me^{mx} - 10e^{mx} = 0$
Factoring out e^{mx}
$e^{mx}(5m^2 + 5m - 10) = 0$
$\neq 0$ → must have equal zero!
$5m^2 + 5m - 10 = 0$
Solve for "m"

$y_1 = e^{\left(\frac{-b+\sqrt{b^2-4ac}}{2a}\right)x}$
$= e^{\left(\frac{-5+\sqrt{5^2-4\cdot5\cdot(-10)}}{2(5)}\right)x}$
$= e^{\left(\frac{-5+\sqrt{225}}{10}\right)x}$
$= e^{\left(\frac{-5+15}{10}\right)x}$
$= e^{\left(\frac{-5+15}{10}\right)x}$
$= e^{(1)x}$

$y_2 = e^{\left(\frac{-b-\sqrt{b^2-4ac}}{2a}\right)x}$
$= e^{\left(\frac{-5-\sqrt{5^2-4\cdot5\cdot(-10)}}{2(5)}\right)x}$
$= e^{\left(\frac{-5-\sqrt{225}}{10}\right)x}$
$= e^{\left(\frac{-5-15}{10}\right)x}$
$= e^{\left(\frac{-5-15}{10}\right)x}$
$= e^{(-2)x}$

$y = c_1e^{x} + c_2e^{-2x}$

Question 6

Auxiliary equation corresponding to the given homogeneous differential equation is
$9r^2 + 24r + 16 = 0$
$\Rightarrow (3r+4)^2 = 0$
$\Rightarrow r = -\frac{4}{3}, -\frac{4}{3}$
General solution is $y_c = c_1e^{-\frac{4}{3}x} + c_2xe^{-\frac{4}{3}x}$
Therefore $r = -\frac{4}{3}$