

MATH 251-019: Homework 5 (Due: 09/27/2017)

Please make your hand-writing clear to read. Please box your final answer.

- (Spring 2016, Exam 1, Question 6) Which equation below has the property that **all** of its nonzero solutions become unbounded as $t \rightarrow \infty$?
 - $3y'' + 2y' - y = 0$
 - $y'' - y' - 4y = 0$
 - $y'' + y' + 4y = 0$
 - $y'' - 2y' + y = 0$

- Which equation below has the property that **some, but not all**, of its nonzero solution converge to zero as $t \rightarrow \infty$?
 - $y'' + 9y = 0$
 - $y'' - 4y' - 5y = 0$
 - $y'' - 4y' + 5y = 0$
 - $y'' + 4y' + 4y = 0$

- (Fall 2015, Exam 1, Question 6) Suppose $y_1(t) = e^{-\pi t}$ and $y_2(t) = e^{\sqrt{2}t}$ are two solutions of a certain second order differential equation

$$y'' + p(t)y' + q(t)y = 0.$$

Which of the following statements is **false**?

- $y(t) = 0$ is another solution.
 - $y(t) = \sqrt{2}e^{-\pi t} - \pi e^{\sqrt{2}t}$ is another solution.
 - $y(t) = e^{(\sqrt{2}-\pi)t}$ is another solution.
 - $y_1(t)$ and $y_2(t)$ form a pair of fundamental solutions.
- (Spring 2014, Exam 1, Question 11) Given that $y_1(t) = t^4$ is a known solution of the linear differential equation

$$t^2y'' - 7ty' + 16y = 0, \quad t > 0.$$

Use reduction of order to find the general solution of the equation.

- (Fall 2016, Exam 1, Question 14) Consider the second order nonhomogeneous linear equation

$$y'' + 4y' + 5y = 5t + 9 + 2e^{-t}.$$

- Find $y_c(t)$, the solution of its corresponding homogeneous equation.
- Find its general solution.

- (c) What is the **form** of particular solution Y that you would use to solve the following equation using the Method of Undetermined Coefficients?
DO NOT ATTEMPT TO SOLVE THE COEFFICIENTS.

$$y'' + 4y' + 5y = 7te^{-2t} \cos t.$$

6. (Spring 2016, Exam 1, Question 13) Consider the second order nonhomogeneous linear equation

$$y'' - 2y' + 5y = 5t^2 + 6t - 12.$$

- (a) Find $y_c(t)$, the solution of its corresponding homogeneous equation.
(b) Find a particular function $Y(t)$ that satisfies the equation.
(c) Write down the general solution of the equation.
(d) What is the **form** of particular solution Y that you would use to solve the following equation using the Method of Undetermined Coefficients?
DO NOT ATTEMPT TO SOLVE THE COEFFICIENTS.

$$y'' - 2y' + 5y = e^t(t^2 + t) \cos(2t).$$

7. (Fall 2015, Exam 1, Question 13) Consider the second order nonhomogeneous linear equation

$$y'' - 4y' = 5 - e^{2t}.$$

- (a) Find $y_c(t)$, the solution of its corresponding homogeneous equation.
(b) Find its general solution by using the Method of Undetermined Coefficients.
(c) What is the **form** of particular solution Y that you would use to solve the following equation using the Method of Undetermined Coefficients?
DO NOT ATTEMPT TO SOLVE THE COEFFICIENTS.

$$y'' - 4y' = t^2 + 2te^{4t} \sin(t).$$

8. (Spring 2015, Exam 1, Question 14) Consider the second order nonhomogeneous linear equation

$$y'' - 6y' - 7y = 8e^{-t} - 7t - 6.$$

- (a) Find $y_c(t)$, the solution of its corresponding homogeneous equation.
(b) Find a particular function $Y(t)$ that satisfies the equation.
(c) Write down the general solution of the equation.
(d) What is the **form** of particular solution Y that you would use to solve the following equation using the Method of Undetermined Coefficients?
DO NOT ATTEMPT TO SOLVE THE COEFFICIENTS.

$$y'' - 6y' - 7y = e^t(t^2 + 1) \sin(2t).$$