

Review for Exam III

MATH 2306 (Ritter)

Sections Covered: 8, 9

This review is provided as a courtesy to give some idea of what material is covered. Nothing else is intended or implied.

(1) Find the general solution of the homogeneous equation.

(a) $y'' - 2y' + 5y = 0$

(b) $y'' + 6y' + 9y = 0$

(c) $y'' - 36y = 0$

(d) $y^{(4)} + 3y'' - 4y = 0$

(e) $y''' + 2y'' + y' = 0$

(f) $2y'' - 3y' - 2y = 0$

(2) Solve each IVP

(a) $y'' - 3y' + 2y = 0$ $y(0) = 0$, $y'(0) = 2$

(b) $y'' + 2y' = 0$ $y(1) = 0$, $y'(1) = 1$

(c) $y'' - 2y' + 5y = 0$ $y(0) = 0$, $y'(0) = 2$

(4) Find the general solution of each nonhomogeneous equation

(a) $y'' + 6y' + 9y = e^x + 3e^{-3x}$

(b) $y'' + y' - 12y = 2x$

(c) $y'' + y = 4 \cos x$

(5) Determine the **form** of the particular solution. (Do not bother trying to find any of the coefficients A , B , etc.)

(a) $y'' - 4y' + 5y = x \cos 2x$

(b) $y'' + y = x^3 + e^x$

(c) $y'' - 4y' + 5y = xe^{2x} \sin x$

(d) $y'' - 2y' + y = 1 + e^x$

(6) For each homogeneous equation, write out the characteristic equation. If the equation doesn't have a characteristic equation, briefly state why.

(a) $3 \frac{d^4 y}{dx^4} - 2 \frac{d^3 y}{dx^3} + \frac{dy}{dx} - 4y = 0$

(b) $4y'' + 2xy' + e^x y = 0$

(c) $x^3 y''' + 2x^2 y'' - 4xy' + y = 0$

(d) $y^{(6)} + 16y^{(4)} - 12y'' + y = 0$

(7) For each of the following nonhomogeneous equations, determine whether the method of undetermined coefficients **could** be used to determine y_p . If not, give a brief explanation. For each, assume that the complementary solution can be found.

(a) $3 \frac{d^4 y}{dx^4} - 2 \frac{d^3 y}{dx^3} + \frac{dy}{dx} - 4y = x^3 e^x$

(b) $4y'' + 2y' + y = \frac{1}{1 + x^2}$

(c) $x^3 y''' + 2x^2 y'' - 4xy' + y = \sin(2x) + x$

(d) $y^{(6)} + 16y^{(4)} - 12y'' + y = x \ln x$