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M20580 L.A. and D.E. Tutorial
Worksheet 13

1. Give the form of a particular solution y_p to each of the following nonhomogeneous linear differential equations. Do not find the values of the constants.

   (a) $y'' + 4y' + 4y = xe^{7x}$

   (b) $y'' + 9y = \sin(2x)$

   (c) $y'' + 9y = \sin(3x)$

   (d) $y'' - 6y' + 9y = x^2 + e^x \cos(4x)$,

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

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2. Consider the differential equation

$$y'' + 4y' + 4y = xe^{-2x}$$

Using the method of undetermined coefficients,

(a) Find a particular solution y_p

(b) Find the general solution.

3. Using variation of parameters, find a particular solution for

$$y'' + 4y = \sec(2t)$$

4. The differential equation

$$(x^2 - 2x)y'' + (2 - x^2)y' + (2x - 2)y = 0$$

has solutions $y_1(x) = e^x$ and $y_2(x) = x^2$.

(a) Find the associated Green's function, $G(x, t)$.

(b) Use the Green's function to find a particular solution of the differential equation

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

satisfying $y_p(0) = 0$ and $y_p'(0) = 0$

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5. Solve the initial-value problem: $y'' + y = -3\sin(x)\cos(x)$, $y(0) = 3$, $y'(0) = 4$