Math 3350

Midterm II

Name:

(please print)

(1) We want to find two homogeneous solutions $y_1(x)$, $y_2(x)$ for the equation

$$\frac{d^2y}{dx^2} + 16\frac{dy}{dx} + 63y = 0$$

write

$$y(x) = A\,y_1(x) + B\,y_2(x)$$

and assume initial conditions given by

$$y(0) = 1, \quad y'(0) = 3$$

calculate A and B. Hence write down $y(x)$.

(2) We want to find two homogeneous solutions $y_1(x), y_2(x)$ for the equation

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 25y = 0$$

Write

$$y(x) = A\,y_1(x) + B\,y_2(x)$$

and assume initial conditions given by

$$y(0) = 0, \quad y'(0) = 12$$

Calculate A and B. Hence write down $y(x)$.

(3) We are interested in obtaining a particular solution $\hat{y}_p(x)$ of

$$\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = -\sin 5x$$

The homogeneous solution $y_h(x)$ is given as

$$y_h(x) = Ae^{-x} + Be^{-2x}$$

(a) Calculate the particular solution

$$y_p(x)$$

(b) Write down

$$y(x) = Ae^{-x} + Be^{-2x} + y_p(x)$$

choose initial condition

$$y(0) = \frac{15}{15^2 + 23^2}$$

$$y'(0) = \frac{5 \cdot 23}{15^2 + 23^2} - 1$$

Calculate A and B from the above data.

(c) Hence write down $y(x)$.

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