

Phys 3010 Mathematical Physics Assignment 13 Answers

1. Find the full solution to the differential equation

$$\frac{d^2 y}{dx^2} - 4 \frac{dy}{dx} - 5y = 6$$

given that $y = 8$ and $dy/dx = 16$ when $x = 0$.

$$y = \frac{21}{5} e^{5x} + 5e^{-x} - \frac{6}{5}$$

2. Find the full solution to the differential equation

$$\frac{d^2 y}{dt^2} - \frac{dy}{dt} - 6y = 1 - 18t^2$$

given that $y = 1$ and $dy/dt = 1$ when $x=0$.

$$y = \frac{2}{5} e^{3t} - \frac{2}{5} e^{-2t} + 1 - t + 3t^2$$

3. Find the full solution to the differential equation

$$\frac{d^2 x}{dt^2} - 4 \frac{dx}{dt} + 13x = 4 \sin(t)$$

given that $x = 0$ at $t=0$ and $x = -1$ when $t = \pi/2$.

$$x = \frac{13}{10} \frac{e^{2t} \sin(3t)}{e^{-\pi}} - \frac{1}{10} e^{2t} \cos(3t) + \frac{3}{10} \sin(t) + \frac{1}{10} \cos(t)$$

4. Find the full solution to the differential equation

$$\frac{dx}{dt} + x = 4 \cos(t) \cos(2t)$$

given that $x = 0$ at $t = 0$. (Hint: first think trig functions for the right hand side)

$$x = \cos(t) + \sin(t) + \frac{1}{5} \cos(3t) + \frac{3}{5} \sin(3t) - \frac{6}{5} e^{-t}$$