

Phys 3010 Mathematical Physics Assignment 15

1. Find the full solution to the differential equation

$$\frac{d^3 y}{dx^3} + 2 \frac{d^2 y}{dx^2} - 5 \frac{dy}{dx} - 6y = 255 \sin(8x)$$

given that $y = 5$, $dy/dx=0$, and $d^2y/dx^2=0$ all when $x=0$.

$$y = \frac{414}{949} \cos(8x) - \frac{201}{1898} \sin(8x) + \frac{131}{73} e^{-3x} - \frac{3}{13} e^{-x} + 3e^{2x}$$

2. Find the full solution to the differential equation

$$\frac{d^2 y}{dt^2} - 8 \frac{dy}{dt} + 12y = 6e^{4t}$$

given that $y = 1$ and $dy/dt=2$ when $x=0$.

$$y = \frac{7}{4} e^{2t} + \frac{3}{4} e^{6t} - \frac{3}{2} e^{4t}$$

3. Find the full solution to the differential equation

$$\frac{d^2 x}{dt^2} + 2 \frac{dx}{dt} + 5x = 5e^{3t}$$

given that $x = 0$ at $t=0$ and $x = 4$ when $t = \pi/4$.

$$x = 4 \frac{e^{-x}}{e^{-\frac{\pi}{4}}} \sin(2x) - \frac{1}{4} \sin(2x) \frac{e^{-x}}{e^{-\pi}} - \frac{1}{4} \cos(2x) e^{-x} + \frac{1}{4} e^{3x}$$

4. Find the full solution to the differential equation

$$\frac{dx}{dt} + 6x = 3e^t \sin(4t)$$

given that $x = dx/dt = 0$ at $t=0$.

$$x = \frac{21}{65} e^t \sin(t) - \frac{12}{65} e^t \cos(t) + \frac{12}{65} e^{-6t}$$