

Phys 3010 Mathematical Physics

Assignment 8

For the following problems, solve by hand, although you can check your answers using Maple (highly recommended.)

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 $x=0$. (To input the third initial condition you can use either $D^{(2)}(y)(0)$ or $D(D(y))(0)$ to denote the second differential. For more details search for “D” in the help menu.)

2. Find the full solution to the differential equation

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

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

3. Find the full solution to the differential equation

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

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

4. Find the full solution to the differential equation

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

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

Hint: first write

$$\sin(\theta) = \frac{e^{i\theta} - e^{-i\theta}}{2i}$$

and then rearrange your answer to yield a real trigonometric representation.