

Phys 3010 Mathematical Physics

Assignment 7

For the following problems, solve by hand, although you can check your answers using Maple (highly recommended.) The Maple syntax is `dsolve({eqn,ic1,ic2},x(t))` for an equation containing x as a function of t . For example in question 1 use

$$\text{dsolve}(\{\text{eqn}, y(0)=1, D(y)(0)=2\}, y(x))$$

where `eqn` has been previously defined as the differential equation in the question.

1. Find the full solution to the differential equation

$$\frac{d^2 y}{dx^2} - 4 \frac{dy}{dx} - 5y = 0$$

given that $y = 2$ and $dy/dx = 16$ when $x = 0$.

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 $x=0$.

3. Find the full solution to the differential equation

$$\frac{d^2 x}{dt^2} - 4 \frac{dx}{dt} + 13x = 0$$

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

4. Find the full solution to the differential equation

$$\frac{dx}{dt} + 2x = 13 \cos(t) \sin(2t)$$

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