## PHYS2170 Mathematical Methods 4

Problems Class 8

1. Solve the differential equation

$$\frac{\partial^2 y}{\partial x^2} = -9\,y,$$

with boundary condition y(0) = 5 and y'(0)=0.

2. The temperature T(t) of a body cooling by radiation (dead star, last night's dinner, *etc*) obeys the following differential equation:

$$\frac{dT}{dt} = -K T^4.$$

Find the general solution to this differential equation for a given initial condition  $T(0) = T_0$ .

3. Consider the following homogeneous ODE's:

(i)  
(ii)  
(ii)  
(iii)  

$$\frac{d^2y}{dt^2} = 16y$$

$$\frac{d^2y}{dt^2} - 6\frac{dy}{dt} + 9y = 0$$

$$\frac{d^3y}{dt^3} + 5\frac{d^2y}{dt^2} + 6\frac{dy}{dt} = 0.$$

For each ODE,

- (a) Find the general solution.
- (b) Hence, write down the "basis functions" for each case.