

M1B/Schoenbrun Linear Differential Equations

Solve the differential equations with the stated conditions:

1)  $y'' + 5y' + 4y = 0$  where  $y(0) = -1$  and  $y'(0) = 1$

2)  $y'' + 2y' + y = 0$  where a)  $y(0) = 1$  and  $y'(0) = 0$   
and b)  $y(0) = -1$  and  $y'(0) = -1$

3)  $y'' + 4y' + 5y = 0$  where a)  $y(0) = \frac{1}{2}$  and  $y'(0) = 1$   
and b)  $y(0) = -1$  and  $y'(0) = -3$

For each equation, what is the dimension of the vector space formed by the solutions, and provide a basis for this vector space.

Find a general solution of the following differential equations.

4)  $y'' + 4y' + 4y = 0$

5)  $y''' - 3y'' + 3y' - y = 0$

Find the orthogonal trajectories. Describe the curves. Use your graphing calculator if helpful.

6)  $y^2 = kx^3$

7)  $y = \frac{k}{x}$