

## SIIT, MAS211 – MIDTERM EXAM

1. Find the general solution of the following differential equations

(a)  $y' = \frac{x - e^{-x}}{y + e^{2y}}$                       (b)  $(6x + \sin y - y^2 \cos x)dx + (x \cos y - 2y \sin x - 2)dy = 0$

(c)  $\frac{y'}{y} + 3 = \frac{2}{y}$                       (d)  $y'' + y' + y = 0$

2. Solve the following initial value problems

(a)  $y' - y = \frac{2xe^{2x}}{e^{-x}}$ ,  $y(0) = 0$                       (b)  $y'' - 4y' + 4y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 3$

(c)  $y'' - 3y' - 4y = 0$ ,  $y(0) = 2$ ,  $y'(0) = 3$

3. Given the following second-order differential equation,  $y'' - 5y' + 4y = e^{2x}$ ,

- (a) Find the general solution of the associated homogeneous equation
- (b) Find a particular solution
- (c) Solve the initial value problem (non-homogeneous equation)  $y(0) = 3/2$ ,  $y'(0) = 5$

4. Find a particular solution of the equation  $y'' - 7y' + 10y = 3e^{2x}$

5. Knowing that  $y = \sin x$  is a solution of the homogeneous equation below, find a second, linearly independent solution by the method of reduction of order.

$$y'' + (\sin x)y' + (1 - \cos x)y = 0$$