

**Group project 1:
MAC 2302 (Sec 0693)**

Due on 9th June,2011. Please write in detail your solution in a separate paper clearly. You also need to present the problem in class on the due date. Choose any one from the following list.

Total Points: 30

1. Obtain the differential equation for the confocal conics,

$$\frac{x^2}{a^2 + \lambda} + \frac{y^2}{b^2 + \lambda} = 1$$

where λ is a general constant,

and show that the system is its own orthogonal trajectory.

2. Show that $(4x + 3y + 1)dx + (3x + 2y + 1)dy = 0$ represents a family of hyperbolas having as asymptotes the lines

$$x + y = 0 \text{ and } 2x + y + 1 = 0$$

3. If $\frac{dv}{dt} = g(1 - \frac{v^2}{k^2})$ and $v = 0$ if $t = 0$, prove that

$$v = \tanh \frac{gt}{k}.$$