

# MTH2004 M DIFFERENTIAL EQUATIONS

## Tutorial Exercise Set 1

TOPICS: INTRODUCTION TO DIFFERENTIAL EQUATIONS: CRITICAL POINTS AND SOLUTION  
VARIABLE SEPARATION,

*Students are advised to solve by themselves the exercises unfinished during the Practical hour. Practical exercises are designed to help the students to be more confident in solving the Coursework(s) exercises*

- 1) Verify that the one-parameter family  $y^2 - 2y = x^2 - x + c$  is
  - a. an implicit solution of the differential equation  $(2y - 2)y' = 2x - 1$ .
  - b. Find a member of the one-parameter family in part (a) that satisfies the initial condition  $y(0)=1$ .
- 2) Construct an autonomous first-order differential equation  $dy/dx = f(y)$  whose phase portrait is consistent with the given figure



- 3) Find an explicit solution of the given initial-value problem

$$\frac{dy}{dx} = ye^{-x^2}, \quad y(4) = 1.$$

- 4) Find a solution of  $x \frac{dy}{dx} = y^2 - y$  that passes through the indicated points.
  - a) (0,1),
  - b) (0,0),
  - c) (0.5,0.5),
  - d) (2,0.25).