

Math.240, QUIZ 1

Surname&Name:

Q1.a) Write down an example of a **nonlinear** equation of the **second-order**.

$$\frac{d^2 y}{dx^2} + y \frac{dy}{dx} - 3y = 0$$

b) Write down an example of an **IVP** in which the differential equation is of the **third-order**.

$$\frac{d^3 x}{dt^3} - 2tx = \cos x$$

$$x(2) = x'(2) = -3, x''(2) = 0$$

Q2. Determine whether the Existence and Uniqueness Theorem implies that the IVP

$$y \frac{dy}{dx} - 4x = 0$$

$$y(0) = 0$$

has a unique solution. Why?

$f(x,y) = \frac{4x}{y}$ and $\frac{\partial f}{\partial y} = -\frac{4x}{y^2}$ are not even defined at 0. Consequently, there is no rectangle containing

(0,0) in which both f and $\frac{\partial f}{\partial y}$ are continuous. Hence we cannot use the Existence and Uniqueness Thm.

to determine whether the given problem does or does not have a unique soln.