MA 266 Lecture 4

Section 2.2 Separable Equations

In this section, we use x to replace t as the independent variable.

The general form of a *nonlinear* first order equation is

It can be written in the form

If M is a function of x only, and N is a function of y only, then the equation becomes

Such an equation is called _____. A separable equation can be solved by
_____

Example 1. *Show that the equation*

$$\frac{dy}{dx} = \frac{x^2}{1 - y^2}$$

is separable, and then find its solution (in implicit form).

In general, for any separable equation $M(x) + N(y)\frac{dy}{dx} = 0$, we let

Example 2. *Solve the initial value problem*

$$\frac{dy}{dx} = \frac{3x^2 + 4x + 2}{2(y-1)}, \quad y(0) = -1,$$

and determine the interval in which the solution exists.

Example 3. *Solve the initial value problem*

$$y' = \frac{1 + 3x^2}{3y^2 - 6y}, \qquad y(0) = 1.$$

and determine the interval in which the solution is valid.