MA 266 Lecture 10

Section 2.6 Exact Equations and Integrating Factors

In the section, we consider a special class of first order equations known as exact equations.

Example 1. *Solve the differential equation*

$$2x + y^2 + 2xyy' = 0.$$

Let the differential equation be

$$M(x, y) + N(x, y)y' = 0.$$

Suppose we can identify a function $\psi(x, y)$ such that

then

In this case, the equation is called an _____ differential equation.

Question: How can we tell whether a given equation is exact?

Theorem Let M, N, M_y, and N_x be continuous on some rectangular region R. Then the equation

Question: Given an equation is exact, how to find the function ψ?

Example 2. *(Problem #5) Solve the differential equation*

$$(y\cos(x) + 2xe^y) + (\sin(x) + x^2e^y - 1)y' = 0.$$