Shepley L. Ross *Introduction to Ordinary Differential Equations*

Chapter 2. First-Order Equations for Which Exact Solutions Are Obtainable

2.1. Exact Differential Equations and Integrating Factors

2.1.1. Determine whether or not the DE is exact. If it is exact, then solve it:

$$(3x + 2y)\,dx + (2x + y)\,dy = 0.$$

2.1.7 Determine whether or not the DE is exact. If it is exact, then solve it:

$$(y \sec^2 x + \sec x \tan x)\,dx + (\tan x + 2y)\,dy = 0.$$

2.1.11. Solve the IVP: $(2xy - 3)\,dx + (x^2 + 4y)\,dy = 0$, $y(1) = 2$.

2.1.13. Solve the IVP:

$$(2y \sin x \cos x + y^2 \sin x)\,dx + (\sin^2 x - 2y \cos x)\,dy = 0,\ \ y(0) = 3.$$

2.1.21. Consider the DE $(4x + 3y^2)\,dx + 2xy\,dy = 0$.

(a) Show this equation is not exact.

(b) Find an integrating factor of the form x^n, where n is a positive integer.

(c) Multiply the given equation through by the integrating factor found in step (b) and solve the resulting exact equation.