Math 2150 - Homework # 5

Exact Equations

1. (i) Determine whether the given equation is exact. (ii) If the equation is exact, then find a solution to it (your solution may only be an implicit solution, that is you might not be able to solve for y).

   (a) $(2x - 1) + (3y + 7)\dfrac{dy}{dx} = 0$

   (b) $5x + 4y + (4x - 8y^3)y' = 0$

   (c) $-(x + 6y)y' + (2x + y) = 0$

   (d) $\dfrac{2x}{y} - \dfrac{x^2}{y^2} \cdot \dfrac{dy}{dx} = 0$

   (e) $(2y^2 x - 3) + (2yx^2 + 4)y' = 0$

   (f) $\left(2y - \dfrac{1}{x} + \cos(3x)\right)\dfrac{dy}{dx} + \dfrac{y}{x^2} - 4x^3 + 3y\sin(3x) = 0$

2. Find a solution the given exact equation subject to the given initial condition.

   (a) $(2x - 1) + (3y + 7)\dfrac{dy}{dx} = 0, \quad y(1) = 2$

   (b) $(e^x + y) + (2 + x + ye^y)y' = 0, \quad y(0) = 1$

   (c) $\left(\dfrac{3y^2 - x^2}{y^5}\right)\dfrac{dy}{dx} + \dfrac{x}{2y^4} = 0, \quad y(1) = 1$