MATH 3413 Additional problem assigned on 1/16/14

Additional Problem.

(a) Prove that the function $y(x)$ determined implicitly from the equation

$$\frac{1}{3y^3} - \frac{2}{y} = \frac{1}{x} + \ln|x| + C$$

(where C is an arbitrary constant) satisfies the ordinary differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{(x-1)y^5}{x^2(2y^3 - y)} \ .$$

(b) Prove that the function $y(x)$ determined implicitly from the equation

$$\frac{1}{3y^3} - \frac{2}{y} = \frac{1}{x} + \ln|x| - \frac{7}{3}$$

satisfies the initial condition $y(1) = \frac{1}{2}$.