The majority of the credit you receive will be based on the completeness and the clarity of your responses. Please use equal signs where appropriate and write solutions with a logical flow. Show your work, and avoid saying things that are untrue, ambiguous, or nonsensical.

1. Solve the following differential equations.

   (a) $(3x^2 - y^2)\, dx + (xy - x^3 y^{-1})\, dy = 0$

   (b) $\dfrac{dx}{dt} = \dfrac{x^2 + t\sqrt{t^2 + x^2}}{tx}$

   (c) $\dfrac{dx}{dx} = \dfrac{y(\ln y - \ln x + 1)}{x}$

   (d) $\dfrac{dy}{dx} + \dfrac{y}{x} = x^2 y^2$

   (e) $\dfrac{dy}{dx} - y = e^{2x} y^3$

   (f) $\dfrac{dx}{dt} + tx^3 + \dfrac{x}{t} = 0$