8. [8 points]
   a. [5 points] Consider the curve $C$ defined by the equation $\ln(x^2) + y = e^{4y}$.
   For this curve $C$, find a formula for $\frac{dy}{dx}$ in terms of $x$ and $y$. Clearly show every step of your work.
   Solution:
   
   \[
   \frac{d}{dx} \left( \ln(x^2) + y \right) = \frac{d}{dx} \left( e^{4y} \right)
   \]
   
   \[
   \frac{2x}{x^2} + \frac{dy}{dx} = 4e^{4y} \frac{dy}{dx}
   \]
   
   \[
   \frac{2}{x} = 4e^{4y} \frac{dy}{dx} - \frac{dy}{dx}
   \]
   
   \[
   \frac{2}{x} = \frac{dy}{dx} (4e^{4y} - 1)
   \]
   
   \[
   \frac{2}{x(4e^{4y} - 1)} = \frac{dy}{dx}
   \]

   b. [3 points] Let $D$ be a different explicitly defined curve. The curve $D$ passes through the point $(2, 1)$ and satisfies

   \[
   \frac{dy}{dx} = \frac{-2x - y}{x + 3y^2 - 1}.
   \]

   Write an equation for the tangent line to the curve $D$ at the point $(2, 1)$. Show your work.
   Solution: We are given the coordinates of a point on the line so need only to find the slope, which is given by $\frac{dy}{dx}$. Plugging in the point $(2, 1)$ we find that the slope of the tangent line is

   \[
   \frac{dy}{dx} \bigg|_{(2,1)} = \frac{-2(2) - 1}{2 + 3(1)^2 - 1} = \frac{-5}{4}
   \]

   so $y = 1 - \frac{5}{4}(x - 2)$. Using point-slope form we find that an equation for the tangent line at $(2, 1)$ is

   \[
   y = 1 - \frac{5}{4}(x - 2).
   \]