> 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. Determine whether the following equations are exact. If they are, then solve them.

   (a) $(2xy + 3)dx + (x^2 - 1)dy = 0$

   (b) $\left(\dfrac{t}{y}\right) dy + (1 + \ln(y))dt = 0$

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

   (d) $\left(\dfrac{2}{\sqrt{1 - x^2}} + y\cos(xy)\right) dx + \left(x\cos(xy) - y^{-1/3}\right) dy = 0$

2. Solve the following initial value problems. If not exact, find a way to solve it.

   (a) $\left(\dfrac{1}{x} + 2y^2x\right) dx + \left(2yx^2 - \cos y\right) dy = 0,$

   $y(1) = \pi$

   (b) $\left(ye^{xy} - \dfrac{1}{y}\right) dx + \left(xe^{xy} + \dfrac{x}{y^2}\right) dy = 0,$

   $y(1) = 1$

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

   $y(\pi) = 1$