2.6: Exact Differential Equations and Integrating Factors

Examples:
Show the ODE $2x + y^2 + 2xyy' = 0$ is exact and solve it.

Determine whether the IVP $\dfrac{dy}{dt} = \dfrac{e^t \sin(y) - 3y}{3t - e^t \cos(y)}$, $y(0) = \dfrac{\pi}{4}$ is exact or not. If so, solve it.

Show that the following ODEs are not exact, but that there is an integrating factor which makes them exact. Then solve the ODEs (on your own).
$y + (2xy - e^{-2y})y' = 0$

$(-y^2 - 2ty) + (3 + t^2)y' = 0$, $y(0) = 1$