1. One of the following two differential equations is exact and the other will need an integrating factor. Solve both:

(a) \((2y^3 + 2y) + (3xy^2 + x) \frac{dy}{dx} = 0\)

(b) \(2xy^2 + (2x^2 y + \sin(y)) \frac{dy}{dx} = 0\)
2. Let’s play a game titled: Design your own nonexact differential equation with nontrivial integrating factor! Just like when I was a kid!

   Step 1: Choose some nontrivial $H(x, y)$.

   Step 2: Create an exact differential equation by doing $H_x + H_y \frac{dy}{dx} = 0$.

   Step 3: Make it non-exact by choosing some nontrivial $\mu(x, y)$ and dividing it out of everything. Try to choose your $H(x, y)$ so that when you divide out $\mu(x, y)$ you get something not obvious.