1. Solve the following ODEs/IVPs. In the case of IVPs state the interval of definition of the solution.

   (a) $xy' + 2y = \sin(x), \quad y(\pi/2) = 1$

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

   (c) $\sin(2x)\,dx + \cos(3y)\,dy = 0, \quad y(\pi/2) = \pi/3$

   (d) $y' = \dfrac{x(x^2+1)}{4y^3} \quad y(0) = -1/\sqrt{2}$

   (e) $(3x^2 - 2xy + 2)\,dx + (6y^2 - x^2 + 3)\,dy = 0$

   (f) $(e^x \sin(y) - 2y\sin(x))\,dx + (e^x\cos(y) + 2\cos(x))\,dy = 0$

2. Find a solution of
$$\frac{dy}{dx} = \frac{1}{e^y - x}, \quad y(1) = 0$$
by considering x as a function of y.

3. Solve the following ODE where $-1 < x < 1$:
$$y^2(1-x^2)^{1/2}\,dy = \sin^{-1}(x)\,dx$$

4. Find the value of b that makes the following equation exact and then use that value of b to solve:
$$(ye^{2xy} + x)\,dx + bxe^{2xy}\,dy = 0$$