(1) Find the value of \( m \) so that the function \( y = x^m \) is a solution of differential equation
\[ x^3 y''' + 5x^2 y'' + 7xy' + 8y = 0. \]

(2) Solve the differential equation \( dy + x^2 dx = x^2 e^{3y} dx \).

(3) Solve the differential equation \((1 + y^2) dx = (\tan^{-1} y - x) dy \).

(4) Find the largest region \( R \) containing a point \((x_0, y_0)\) in the xy-plane for which the IVP
\[ \frac{dy}{dx} = \frac{\sqrt{3 + 2y - y^2}}{\ln x}; \quad y(x_0) = y_0 \]
would have a unique solution.