1. For each of the following differential equations, obtain the most general solution which is representable by a Maclaurin series:

a) \( (1 - \frac{1}{2} x^2) \frac{d^2 y}{dx^2} + \frac{dy}{dx} - y = 0 \)

b) \( x^2 \frac{d^3 y}{dx^3} - \frac{dy}{dx} + y = 0 \)

c) \( (x^3 + x) \frac{d^2 y}{dx^2} - (x^2 - 2) \frac{dy}{dx} - (x + 2)y = 0 \)

2. Locate and classify the singular points of the following differential equations:

a) \( (x - 1) \frac{d^2 y}{dx^2} + \sqrt{x} y = 0 \) \( (x \geq 0) \)

b) \( \frac{d^3 y}{dx^3} + \frac{dy}{dx} \log x + xy = 0 \) \( (x \geq 0) \)

c) \( \frac{d^2 y}{dx^2} + y \cos \sqrt{x} = 0 \) \( (x \geq 0) \)

3. Use the method of Frobenius to obtain the general solution of each of the following differential equations, valid near \( x = 0 \)

a) \( 2x \frac{d^2 y}{dx^2} + (1 - 2x) \frac{dy}{dx} - y = 0 \)

b) \( x \frac{d^2 y}{dx^2} + x \frac{dy}{dx} + (x^2 - \frac{1}{4})y = 0 \)

c) \( x(1 - x) \frac{d^2 y}{dx^2} - 2 \frac{dy}{dx} + 2y = 0 \)