Part I

Please do the following problems from the Textbook.

Section 2.6: Problem 13, 16, 20, 24, 30, 31

Section 3.1: Problem 1, 5, 6, 20, 21

For 9th Edition textbook: Same sections and question numbers

Part II

1. Consider the initial value problem

\[ x' = \frac{-2tx}{t^2 + \cos(x) + 2}, \quad x(0) = \pi \]

(a) Find the solution of the initial value problem in implicit form.
(b) Determine its interval of existence.

2. For a second order differential equation with the dependent variable missing, i.e.
   an equation of the form \( x'' = f(t, x') \), the substitution \( v = x', \ v' = x'' \) leads to a first order equation of the form \( v' = f(t, v) \). If this equation can be solved for \( v \), then \( x \) can be obtained by integrating \( dx/dt = v \). Note that an arbitrary constant is obtained in solving the first order equation for \( v \), and a second is introduced in the integration for \( x \). Use this substitution to solve the second order differential equation:

\[ t^2 x'' + 2tx' - 1 = 0, \quad t > 0 \]