

1. Solve the equation

$$\frac{dy}{dt} + y = \frac{1}{1 + e^t}.$$

2. Solve the equation

$$\frac{dy}{dx} = \frac{1 + \cos x}{2 - \sin y}.$$

3. Solve the equation

$$\frac{dy}{dx} = \frac{x+y}{x-y}.$$

5. For the equation

$$\frac{dy}{dt} = y^2(1 - y^2),$$

determine the equilibrium points, and classify each one as asymptotically stable, unstable, or semistable. Draw the phase line. You do **not** need to solve the equation.

6. Solve the equation

$$(x^2 + y) dx + (x + e^y) dy = 0.$$

7. Solve the equation

$$(2y + 3x) dx + x dy = 0.$$