

Section 9.1

1. Solve the equation  $\frac{dy}{dx} = \frac{x - e^{3x}}{3y^2}$

2. Solve  $\frac{dy}{dx} = \frac{xy}{2 \ln y}$

3. Solve  $y' = e^{3x-y}$ ,  $y(0) = 2$ .

4. Solve  $y' = 1 + y^2 - 2x - 2xy^2$ ,  $y(0) = 0$

5. A tank contains 200 liters of water with 5 kg of dissolved salt. Pure water enters the tank at a rate of 10 liters per minute. The solution is kept mixed and drains from the tank at the same rate. How much salt is in the tank after 8 minutes?

Section 9.2

6. Solve  $\frac{dy}{dx} + 3y = x$ .

7. Solve  $y' - \frac{y}{x} = 2$ ,  $y(8) = 2$

8. Solve  $x \frac{dy}{dx} + 2y = \sin(x^2)$ ,  $y(\sqrt{\pi}) = 1$

9. A tank contains 1000 liters of pure water. Brine that contains 0.1 kg of salt per liter enters the tank at a rate of 5 liters per minute. The solution is kept mixed and drains from the tank at the same rate. How much salt is in the tank at time  $t$  minutes?

Section 9.3

10. Find the length of the curve  $y = 2x^{3/2}$ ,  $0 \leq x \leq \frac{1}{4}$ .

11. Find the length of the curve  $x = \ln(\cos y)$ ,

$$0 \leq y \leq \frac{\pi}{4}.$$

12. Find the length of the parametric curve  $x = 3t - t^3$ ,  $y = 3t^2$ ,  $0 \leq t \leq 2$ .