

9.3 - Separable [Differential] Equations

Preparation (Watch at Home)

9.3a

Description of differential equation

Exercises:

Solve the differential equation.

$$y' = 3xy$$

$$\frac{du}{dt} = \frac{1 + t^4}{ut^2 + u^4t^2}$$

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$$\frac{dz}{dt} + e^{t+z} = 0$$

Find the solution of the differential equation that satisfies the given initial condition.

$$\frac{dy}{dx} = \frac{x \sin x}{y}, \quad y(0) = -1$$

9.3d

Exercise:

Find the orthogonal trajectories of the family of curves. Use a graphing device to draw several members of each family on a common screen.

$$y^2 = kx^3$$

$$y = \frac{1}{x + k}$$

In-Class Discussion

9.3c

Population growth model

$P(t) = P(0)e^{kt}$, where $P(0)$ is the initial population and k is the constant relative growth rate

9.3e

Exercise:

A tank contains 1000 L of pure water. Brine that contains 0.05 kg of salt per liter of water enters the tank at a rate of 5 L/min. Brine that contains 0.04 kg of salt per liter of water enters the tank at a rate of 10 L/min. The solution is kept

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In-Class Practice

1. Solve the differential equation.

$$y' + xe^y = 0$$

Find the solution of the differential equation that satisfies the given initial condition.

2. $\frac{dP}{dt} = \sqrt{Pt}, P(1) = 2$

3. $\frac{dL}{dt} = kL^2 \ln t, L(1) = -1$

4. Find the orthogonal trajectories of the family of curves.

$$y = ke^x$$

5. The air in a room with volume 180 m^3 contains 0.15% carbon dioxide initially. Fresher air with only 0.05% carbon dioxide flows into the room at a rate of $2 \text{ m}^3/\text{min}$ and the mixed air flows out at the same rate. Find the percentage of

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