



Calculus AB, section 9.1 – Solving Differential Equations using the Separation of Variables method

Example 1

Find the general solution to $y \frac{dy}{dx} - x = 0$ by the separation of variables method.

$$y \frac{dy}{dx} = x$$

$$y^2 = x^2 + C$$

$$\int y \, dy = \int x \, dx$$

$$\frac{1}{2}y^2 = \frac{1}{2}x^2 + C$$

Find a particular solution if $y(0) = 3$.

Example 2 – Initial Value Problem

Solve the initial value problem $y' = -ty$ with $y(0) = 3$.

Example 3

Solve: $\sqrt{1-x^2} y' = xy$

Sketch y given the initial condition $y(0) = 1$.

Example 4

Solve $y' = x \sec y$

Sketch y given the initial condition $y(0) = 1$.

Example 5

A cylindrical tank of height 9 feet and radius 2 feet is filled with water. Water drains through a square hole of side 1 inch in the bottom. Determine the water level $y(t)$ at time t (seconds). How long does it take for the tank to go from full to empty?

