

Separation of Variables

A differential equation of the form

$$M(x) + N(y) \frac{dy}{dx} = 0$$

is considered a separable differential equation because all the x terms and the dx can be put on one side of the equation and all the y terms and the dy can be put on the other side.

1. Find the general solution of the differential equation

$$\frac{dy}{dx} = \frac{x^2+2}{3y^2}$$

2. Find the general solution of the differential equation

$$4yy' - 3e^x = 0$$

3. Find the particular solution of the differential equation

$$\frac{dr}{ds} = e^{r-2s}$$

with initial condition $r(0) = 0$.

4. Find an equation of the graph that passes through the point and has the given slope.

$$(8, 2), \quad y' = \frac{2y}{3x}$$

5. Find the particular solution to $y(x + 1) + y' = 0$ at $(-2, 1)$.

6. Show that $y = \cos 3x$ is a solution to $\frac{d^2y}{dx^2} + 9y = 0$.