

## 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  $\frac{d^2y}{dx^2} + 9y = 0$ .