# Partial derivatives

Find the partial derivatives of the following function:

$$z = (x/y)^3 - 2^y x^2 y + e^2$$

## Solution

First, we differentiate with respect to y. We solve the first term by the chain rule, the second term by the product rule, and the third term is eliminated as it is a constant.

$$\frac{\partial z}{\partial y} = 3(x/y)^2(-x/y^2) - [2^y \ln(2)x^2 y + 2^y x^2]$$

We rearrange to get the result from the guide:

$$\frac{\partial z}{\partial y} = -3x^3/y^4 - 2^y \ln(2)x^2 y - 2^y x^2 = -3x^3/y^4 - x^2 2^y (y \ln(2) + 1)$$

Now we take the derivative with respect to x. For this, we use the chain rule for the first term, the second term is solved using the derivatives table, and the third term is eliminated as it is a constant.

$$\frac{\partial z}{\partial x} = 3(x/y)^2(1/y) - 22^y xy = 3x^2/y^3 - 2^{y+1}xy$$