Math Diversion 1033

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With me, everything turns into mathematics.
— Rene Descartes
(P.S. I calculate; therefore I am.)

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 Source: https://www.youtube.com/watch?v=xDQC_O6dOiA
Title: How to Solve Logarithmic Equations
 Presenter: Nuel's Academy
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1 Problem

[see timestamp 4:20] Given the relations

$$2^{2x-3y} = 32\,, \tag{1a}$$

$$\log_y x = 2\,, \tag{1b}$$

solve for x, y.

2 Solution

Since $32 = 2^5$ then (1a) becomes

$$2x - 3y = 5\,. \tag{2}$$

Using a common property of logarithms, (1b) becomes

$$\frac{\log x}{\log y} = 2\,, \tag{3}$$

which implies that

$$\log x = 2\log y = \log y^2\,, \tag{4}$$

which further implies that

$$x = y^2\,. \tag{5}$$

On solving (2) and (5) as a system, we get for pairs (x, y)

$$(25/4, 5/2) \quad \text{and} \quad (1, -1)\,, \tag{6}$$

though only that first pair makes sense in the original equations.