Cambridge International AS & A Level

Mathematics 9709/32

Paper 3 Pure Mathematics 3 **May/June 2024**

Question No (3)

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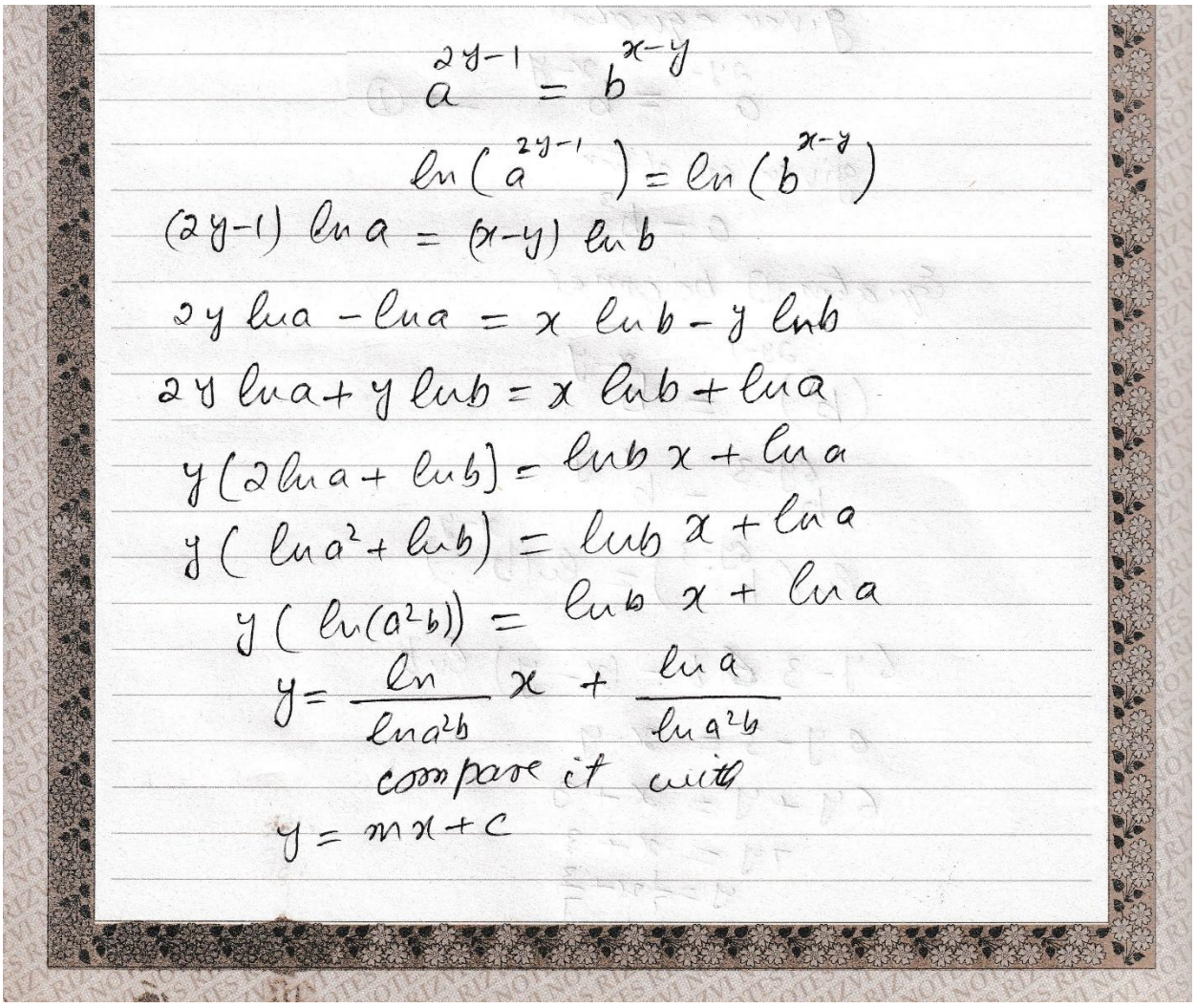
The variables x *and* y satisfy the equation $a^{2y-1} = b^{x-y}$, where a *and* b are constants.

(a) Show that the graph of y *against* x *is* a straight line.

(b) Given that $a = b^3$, state the equation of the straight line in the form $y = px + q$, where p and q are rational numbers in their simplest form.

Solution:

(a)



so its graph is a straight line due to one power of x and y.

(b) Given that $a = b^3$, state the equation of the straight line in the form, $y = px + q$, where p and q are rational numbers in their simplest form.

Solution

given equation

$$a^{2y-1} = b^{x-y} \longrightarrow (1)$$

given condition

$$a = b^3$$

Equation (1) becomes

$$(b^3)^{2y-1} = b^{x-y}$$

$$b^{6y-3} = b^{x-y}$$

$$\ln(b^{6y-3}) = \ln(b^{x-y})$$

$$6y - 3 \ln b = (x - y) \ln b$$

$$6y - 3 = x - y$$

$$6y + y = x + 3$$

$$7y = x + 3$$

$$y = \frac{1}{7}x + \frac{3}{7}$$