L7 Solving Exponential Equations without a common base.notebook

Lesson 7 Solving Exponential Equations

Ex. 1) Solve.

Steps (Without a Common Base):
1. Apply logarithms to both sides.
2. Apply the laws of logarithms.
3. Solve for x
4. Evaluate logs with calculator (last step only)

a) $4^x = 12$

$\log 4^x = \log 12$ Apply logs

$x \log 4 = \log 12$ Power law

$x = \dfrac{\log 12}{\log 4}$ Isolate x

$x = 1.792$ Calc

b) $2(3^x) = 5$

$\log (2(3^x)) = \log 5$

$\log 2 + x \log 3 = \log 5$ ∗ Product and power law

$x \log 3 = \log 5 - \log 2$

$x = \dfrac{(\log 5 - \log 2)}{\log 3}$

$x = 0.834$

c) $3^{x+1} = 6^x$

distribute $\log 3^{x+1} = \log 6^x$

$(x+1) \log 3 = x \log 6$

$x \log 3 + \log 3 = x \log 6$

$\log 3 = x \log 6 - x \log 3$ collect terms with x

$\log 3 = x (\log 6 - \log 3)$ Factor x out

Need brackets $\dfrac{\log 3}{(\log 6 - \log 3)} = x$

$1.585 = x$

1

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d) $19^{x-5} = 3^{x+2}$

$(x-5) \log 19 = (x+2) \log 3$ Power law

$x \log 19 - 5 \log 19 = x \log 3 + 2 \log 3$ Distribute

$x \log 19 - x \log 3 = 2 \log 3 + 5 \log 19$ Collect terms with x

$x (\log 19 - \log 3) = 2 \log 3 + 5 \log 19$

$x = \dfrac{(2 \log 3 + 5 \log 19)}{(\log 19 - \log 3)}$ Brackets top and bottom

$x = 9.166$

e) $2(7)^x = 3^{2x-3}$

$\log 2 + x \log 7 = (2x-3) \log 3$ *product and power law

$\log 2 + x \log 7 = 2x \log 3 - 3 \log 3$

$\log 2 + 3 \log 3 = 2x \log 3 - x \log 7$

$\log 2 + 3 \log 3 = x (2 \log 3 - \log 7)$

$\dfrac{(\log 2 + 3 \log 3)}{(2 \log 3 - \log 7)} = x$

$15.872 = x$

d) $e^{x-1} - 5 = 5$

$e^{x-1} = 10$

$(x-1) \ln e = \ln 10$

$x = \ln 10 + 1$

2