Solving Exponential Equations

"Match" the Base

Solve:

① $2^x = 8^{x+3}$

$2^x = (2^3)^{x+3}$

$2^x = 2^{3x+9}$

$\therefore x = 3x+9$

$-2x = 9$

$x = -\frac{9}{2}$

② $2(5^{x-4}) = 50$

$5^{x-4} = 25$

$5^{x-4} = 5^2$

$\therefore x-4 = 2$

$x = 6$

③ $2^x = 4 \cdot 8^{2x}$

$2^x = (2^2)(2^3)^{2x}$

$2^x = (2^2)(2^{6x})$

$2^x = 2^{2+6x}$

$\therefore x = 2+6x$

$-5x = 2$

$x = -\frac{2}{5}$

Cannot match the base ① $2^x = 5$ $x \doteq 2.322$

* log both sides

$\log 2^x = \log 5$

$x \log 2 = \log 5$

$x = \frac{\log 5}{\log 2}$

$x \doteq 2.322$

② $8^x = 71$

log both sides

$\log 8^x = \log 71$

$x \log 8 = \log 71$

$x = \frac{\log 71}{\log 8}$

$x \doteq 2.050$

③ $6^{x/3} = 29$

$\frac{x}{3} \log 6 = \log 29$

$\frac{x}{3} = \frac{\log 29}{\log 6}$

$\frac{x}{3} \doteq 1.879$

$x \doteq 5.638$

④ $3^{x+1} = 5^{2x-1}$

log both sides

$\log 3^{x+1} = \log 5^{2x-1}$

$(x+1)\log 3 = (2x-1)\log 5$

$(x+1)(0.477) = (2x-1)(0.699)$

$0.477x + 0.477 = 1.398x - 0.699$

$0.477x - 1.398x = -0.699 - 0.477$

$x \doteq 1.277$

⑤ $7^{x+9} = 56$

⑥ $3 \cdot 12^{x} = 9^{2x-1}$

log both SIDES

$\log(3 \cdot 12^{x}) = \log 9^{2x-1}$

$\log 3 + \log 12^{x} = \log 9^{2x-1}$

$\log 3 + (x)(\log 12) = (2x-1)(\log 9)$

$x \doteq 1.726$

Solving Exponential Equations

① match base

$5^{x} = 25$

$5^{x} = 5^{2}$

$\therefore x = 2$

② log both sides

$5^{x} = 26$

$\log 5^{x} = \log 26$

$x = \dfrac{\log 26}{\log 5}$