

5.6

WARM UP → make common bases

① $3^{2x} = 27$

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

$$2x = 3$$

$$\boxed{x = \frac{3}{2}}$$

② $5^{x+3} = 25^x$

$$5^{x+3} = (5^2)^x$$

$$x+3 = 2x$$

$$\boxed{3 = x}$$

③ $3^x = 9^{x+2}$

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

$$x = 2(x+2)$$

$$x = 2x + 4$$

$$-x = 4$$

$$\boxed{x = -4}$$

④ $\frac{1}{2} = 4^{x+3}$

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

$$-1 = 2(x+3)$$

$$-1 = 2x + 6$$

$$-7 = 2x$$

$$\boxed{-\frac{7}{2} = x}$$

What if I can't make common bases?

① $2^x = 40$

$$\begin{array}{l} \log 2^x = \log 40 \\ x \log 2 = \log 40 \\ \log 2 \end{array}$$

$$\boxed{x = \frac{\log 40}{\log 2}}$$

← exact answer

$$x = 5.322$$

* Take the log of both sides!

$$\textcircled{2} \quad 5^{x-2} = 200$$

$$\log 5^{x-2} = \log 200$$

$$(x-2) \log 5 = \log 200$$

$$x-2 = \frac{\log 200}{\log 5} + 2$$

+2

$$x = \frac{\log 200}{\log 5} + 2$$

$$x = 5.292$$

$$\textcircled{3} \quad 7^{-x} = 21$$

$$\log 7^{-x} = \log 21$$

$$-x \log 7 = \log 21$$

$$-x = \frac{\log 21}{\log 7}$$

$$x = -\frac{\log 21}{\log 7}$$

$$x = -1.565$$

$$\textcircled{4} \quad 8^{2n-3} = 43$$

$$\log 8^{2n-3} = \log 43$$

$$(2n-3) \log 8 = \log 43$$

$$2n-3 = \frac{\log 43}{\log 8}$$

$$2n = \frac{\log 43}{\log 8} + 3$$

$$n = 4.809$$

$$n = \frac{\log 43}{2 \log 8} + \frac{3}{2}$$

$$\textcircled{5} \quad 5^{x-1} = 3^x$$

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

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

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

$$- \log 5 = x(\log 3 - \log 5)$$

$$\frac{\log 3 - \log 5}{\log 3 - \log 5} \quad \frac{\log 3 - \log 5}{\log 3 - \log 5}$$

$$x = \frac{-\log 5}{\log 3 - \log 5}$$

$$x = 3.151$$

$$\textcircled{6} \quad 4^{3x} = 50$$

$$(3x)\log 4 = \log 50$$

$$3x = \frac{\log 50}{\log 4}$$

$$x = \frac{\log 50}{3 \log 4}$$

.887