

Solve each equation for x.

1) $2^x = 2^{3x-4}$

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

3) $25^{x+3} = 25^{5x-7}$

4) $4^{3x-5} = 4^{8-x}$

5) $5^{x+1} = 25$

6) $3^{x-5} = 27$

7) $2^{3x-4} = 8^{x-1}$

8) $3^{2x-4} = 1$

9) $4^{x+2} = 8$

10) $9^x = 27$

11) $\left(\frac{1}{3}\right)^{x+2} = 9^{3x}$

12) $\left(\frac{1}{4}\right)^{x-1} = 32^{x+3}$

13) $18^{4x} = 18^x$

14) $125^{3-2x} = 5^{x-1}$

15) $4^{x-1} = \frac{1}{64}$

16) $\left(\frac{1}{4}\right)^x = 8^{x-1}$

17) $3^x = 3\sqrt{3}$

18) $5^x = 25\sqrt{5}$

19) $4^{2x} = 16\sqrt[3]{4}$

20) $3^{x-4} = 9\sqrt{3}$

1. $2^x = 2^{3x-4}$

$$x = 3x - 4$$

$$-3x \quad -3x$$

$$-2x = -4$$

$$\frac{-2x}{-2} = \frac{-4}{-2}$$

$$x = 2$$

2. $3^{2x-1} = 3^1$

$$2x - 1 = 1$$

$$+1 \quad +1$$

$$2x = 2$$

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

$$x = 1$$

3. ~~2^{5x+3}~~

~~$$x + 3 = 5x - 7$$~~
~~$$-x \quad -x$$~~

~~$$3 = 4x - 7$$~~
~~$$+7 \quad +7$$~~

~~$$\frac{10}{4} = \frac{4x}{4}$$~~

$$x = 2.5$$

4. $3x - 5 = 8 - x$

$$4x = 13$$

$$x = 13/4$$

5. $5^{x+1} = 25$

$$5^{x+1} = 5^2$$

$$x + 1 = 2$$

$$x = 1$$

6. $3^{x-5} = 27$

$$3^{x-5} = 3^3$$

$$x - 5 = 3$$

$$x = 8$$

7. $2^{3x-4} = 8^{x-1}$

$$2^{3x-4} = 2^{3(x-1)}$$

$$3x - 4 = 3(x - 1)$$

$$3x - 4 = 3x - 3$$

$$-4 = -3$$

$$\text{no solution}$$

8. $3^{2x-4} = 1$

$$3^{2x-4} = 3^0$$

$$2x - 4 = 0$$

$$2x = 4$$

$$x = 2$$

9. $4^{x+2} = 8$

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

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

$$2x + 4 = 3$$

$$2x = -1$$

$$x = -1/2$$

10. $9^x = 27$

$$9^x = 9^{1.5}$$

$$x = 1.5$$

11. $\left(\frac{1}{3}\right)^{x+2} = 9^{3x}$

$$\left(\frac{1}{3}\right)^{x+2} = \left(\frac{1}{3}\right)^{-2(3x)}$$

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

$$x + 2 = -6x$$

$$2 = -7x$$

$$x = -2/7$$

12. $\left(\frac{1}{4}\right)^{x-1} = 32^{x+3}$

$$\left(\frac{1}{2^2}\right)^{x-1} = 2^{5(x+3)}$$

$$2^{-2(x-1)} = 2^{5(x+3)}$$

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

$$-2x + 2 = 5x + 15$$

$$-13 = 7x$$

$$x = -13/7$$

$$13. \quad 18^{4x} = 18^x$$

$$4x = x$$

$$3x = 0$$

$$\frac{3x}{3} = \frac{0}{3}$$

$$x = 0$$

$$14. \quad 125^{3-2x} = 5^{x-1}$$

$$(5^3)^{3-2x} = 5^{x-1}$$

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

$$9-6x = x-1$$

$$10 = 7x$$

$$x = 10/7$$

$$15. \quad 4^{x-1} = \frac{1}{64}$$

$$4^{x-1} = \frac{1}{2^6}$$

$$(2^2)^{x-1} = \frac{1}{2^6}$$

$$(2^2)^{x-1} = 2^{-6}$$

$$2(x-1) = -6$$

$$2x-2 = -6$$

$$2x = -4$$

$$x = -2$$

$$16. \quad \left(\frac{1}{4}\right)^x = 8^{x-1}$$

$$\left(\frac{1}{2^2}\right)^x = 2^{3(x-1)}$$

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

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

$$-2x = 3x-3$$

$$-5x = -3$$

$$x = 3/5$$