

Sec. 6.3: Solving Exponential Equations

Refresh:

1. $x^3 \cdot x^2 = x^5$

2. $\frac{x^8}{x^2} = x^6$

3. $(x^2)^3 = x^6$

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

5. $\sqrt{x} = x^{1/2}$

6. $\sqrt[3]{x^5} = x^{5/3}$

When solving, we are finding the value of 'x' in the exponent.

1. $8^x = 64$ * not $8x = 64$
 Like bases $\frac{8x}{8} = 64$
 ~~$8^x = 8^2$~~ $x = 8$
 $x = 2$

2. $81 = 3^x$ $3 \cdot 3 \cdot 3 \cdot 3 = 81$
 ~~$3^4 = 3^x$~~ $3^4 = 81$
 $4 = x$

3. $2^x - 3 = 29$
 $2^x = 29 + 3$
 $2^x = 32$ $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
 ~~$2^x = 2^5$~~ 2^5
 $x = 5$

$$4. \quad 3^x - 5 = 22$$

$$3^x = 22 + 5$$

$$3^x = 27$$

$$\cancel{3^x} = \cancel{3^3}$$

$$x = 3$$

$$5. \quad 2(3)^x - 5 = 49$$

** DO NOT
MULTIPLY*

$$2(3)^x = 49 + 5$$

$$\cancel{2}(3)^x = \frac{54}{\cancel{2}}$$

$$3^x = 27$$

$$\cancel{3^x} = \cancel{3^3}$$

$$x = 3$$

$$6. \quad 3^{x+1} = 9$$

$$\cancel{3^{x+1}} = \cancel{3^2}$$

$$x+1 = 2$$

$$x = 2 - 1$$

$$x = 1$$

$$7. \quad \cancel{5}^{3x+2} = \cancel{5}^1$$

$$3x+2 = 1$$

$$3x = 1 - 2$$

$$3x = -1$$

$$x = -\frac{1}{3}$$

$$8) \quad \frac{\cancel{8}(3)^{\frac{x}{2}}}{\cancel{8}} = \frac{72}{8}$$

$$3^{\frac{x}{2}} = 9$$

$$\cancel{3^{\frac{x}{2}}} = \cancel{3^2}$$

$$\frac{x}{2} = \frac{2}{1}$$

$$x = 4$$

$$9. \quad 10^{2(x-3)} = 1000$$

$$\cancel{10}^{2(x-3)} = \cancel{10}^3$$

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

$$2x - 6 = 3$$

$$2x = 9$$

$$x = \frac{9}{2} \text{ or } 4.5$$

$$10. \quad 4^{1-2x} = 32$$

$$\overbrace{4 \cdot 4 \cdot 4}^{64}$$

* Both of these need to be brought to base of 2.

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

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$$

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

$$2 - 4x = 5$$

$$-4x = 5 - 2$$

$$\cancel{-4x} = \cancel{3}$$

$$\frac{-4}{-4} = \frac{3}{-4}$$

$$x = -\frac{3}{4}$$

Yours to try:

$$1. \quad 7^x = 49$$

$$x=2$$

$$2. \quad 5^{2x} = 625$$

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

$$2x = 4$$

$$x = 2$$

$$3. \quad 243 = 9^{2x+1}$$

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

$$\cancel{3^5} = \cancel{3}^{4x+2}$$

$$5 = 4x + 2$$

$$3 = 4x$$

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

$$4. \quad 3(6)^{2x-3} = 648$$