Precalculus Unit 4 Homework—Solving Exponential Equations

"Why was Papa Shoe mad at his son?"

Solve each equation. The answer to each problem will match a letter that will allow you to figure out the joke.

1. $3^x = 243$ $x = 5$ — A: 16
2. $2^x = \left(\frac{1}{16}\right)$ $x = -4$ — W: -7
3. $\left(\frac{1}{3}\right)^x = 3$ $x = -1$ — S: $\frac{7}{2}$
4. $5^{x+2} = 25^x$ $x = 2$ — R: -1
5. $8^{2x} = 16$ $x = \frac{2}{3}$ — A: 5
6. $\left(\frac{1}{27}\right)^4 = 9^{2x}$ $x = -3$ — A: -3
7. $10^{x+3} = 0.0001$ $x = -7$ — H: 2
8. $7^x = 49^8$ $x = 16$ — F: $\frac{1}{2}$
9. $\left(\frac{4}{9}\right)^{x-2} = \frac{8}{27}$ $x = \frac{7}{2}$ — E: 1
10. $\left(\frac{1}{2}\right)^{x-2} = 2^x$ $x = 1$ — O: -4
11. $\left(\frac{64}{125}\right)^{2x-8} = \left(\frac{25}{16}\right)^x$ $x = 3$ — E: $\frac{2}{3}$
12. $(2^{3x})(2^{5x}) = 16$ $x = \frac{1}{2}$ — L: 3

H	E	W	A	S	A	L	O	A	F	E	R
4	10	7	1	9	6	11	2	8	12	5	3

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Precalculus Unit 4 Homework—Solving Logarithmic Equations

"What did the vampire doctor say to his patient?"

Solve each equation To figure out the joke, place the letter of each problem above the answer on the line(s) below.

N. $\log_3(2x-1)=3$

$x=14$

O. $\log_7(3x-11)=\log_7(x-3)$

$x=4$

H. $\log_6 x+\log_6 3=2$

$x=12$

S. $\log_2(x-3)^3=6$

$x=7$

F. $4\log_8 x=2\log_8 9$

$x=3$

I. $\log x+\log(x+2)=\log 3$

$x=1$

A. $2\log_2(x+6)-\log_2 16=2$

$x=2$

C. $\log_4(x^2-4)-\log_4(x+2)=2$

$x=18$

T. $\log_2(5x+7)-\log_2 x=2$

no solution

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

$x=13$

S	T	O	P	T	H	A	T	C	O	F	F	I	N
7	no solution	4	13	no solution	12	2	no solution	18	4	3	3	1	14

Solving Exponential Eqns

1. $3^x = 3^5$

$x = 5$

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

$x = -4$

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

$-1x = 1$

$x = -1$

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

$x + 2 = 2x$

$2 = x$

5. $(2^3)^{2x} = 2^4$

$6x = 4$

$x = \frac{4}{6} = \frac{2}{3}$

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

$-12 = 4x$

$x = -3$

7. $10^{x+3} = 10^{-4}$

$x + 3 = -4$

$x = -7$

8. $7^x = (7^2)^8$

$x = 16$

9. $\left[\left(\frac{2}{3}\right)^2\right]^{(x-2)} = \left(\frac{2}{3}\right)^3$

$2(x-2) = 3$

$2x - 4 = 3$

$2x = 7$

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

10. $(2^{-1})^{(x-2)} = 2^x$

$-x + 2 = x$

$2 = 2x$

$x = 1$

11. $\left[\left(\frac{4}{5}\right)^3\right]^{2x-8} = \left[\left(\frac{4}{5}\right)^{-2}\right]^x$

$6x - 24 = -2x$

$-24 = -8x$

$3 = x$

12. $2^{8x} = 2^4$

$8x = 4$

$x = \frac{4}{8} = \frac{1}{2}$

Solving Logarithmic Equations

N. $\log_3(2x-1)=3$

$3^3=2x-1$

$28=2x$

$\boxed{x=14}$

O. $3x-11=x-3$

$2x=8$

$\boxed{x=4}$

H. $\log_6 3x=2$

$3x=6^2$

$3x=36$

$\boxed{x=12}$

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

$64=(x-3)^3$

$4=x-3$

$\boxed{7=x}$

F. $\log_8 x^4=\log_8 9^2$

$x^4=81$

$x=\pm 3$

$\boxed{x=3}$

I. $\log(x(x+2))=\log 3$

$x^2+2x=3$

$x^2+2x-3=0$

$(x+3)(x-1)=0$

$\cancel{x=-3}$ $\boxed{x=1}$

A. $\log_2(x+6)^2-\log_2 16=2$

$\log_2\frac{(x+6)^2}{16}=2$

$2^2=\frac{(x+6)^2}{16}$

$64=(x+6)^2$

$\pm 8=x+6$

$x=-6\pm 8$

$\cancel{x=-14}$ $\boxed{x=2}$

C. $\log_4\frac{x^2-4}{x+2}=2$

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

$16x+32=x^2-4$

$0=x^2-16x-36$

$0=(x-18)(x+2)$

$x-18=0$ $x+2=0$

$\boxed{x=18}$ $\cancel{x=-2}$

T. $\log_2\frac{5x+7}{x}=2$

$2^2=\frac{5x+7}{x}$

$4x=5x+7$

$-x=7$

$\cancel{x=-7}$ $\boxed{\text{no soln}}$

P. $\log\frac{x+5}{x-1}=\log\frac{x+2}{x-3}$

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

$$(x+5)(x-3) = (x-1)(x+2)$$
$$x^2+2x-15 = x^2+x-2$$
$$2x-15 = x-2$$
$$x = 13$$