4.6: More Solving!

Quiz tomorrow

Solving exponential equations

Solving log equations

Applying the change of base formula

$$\log_2 19 = \frac{\log 19}{\log 2}$$

34.) $\frac{1}{3}\log_5 12x = 2$

$\log_5 12x = 6$

$5 \qquad 5$

$12x = 15625$

$x = 1302.083$

35.) $5.2\log_4 2x = 16$

$$\log_4 2x = \frac{16}{5.2}$$

$$4 \qquad\qquad 4$$

$$2x = 4^{16/5.2}$$

$$\boxed{x = 35.601}$$

41) $\log_5(x+4) + \log_5(x+1) = 2$

$$5^{\log_5(x^2+5x+4)} = 5^2$$

$$x^2 + 5x + 4 = 25$$

$$x^2 + 5x - 21 = 0$$

$$x = \frac{-5 \pm \sqrt{109}}{2} \qquad \frac{-5+\sqrt{109}}{2} \qquad \frac{-5-\sqrt{109}}{2}$$

$$2.720 \qquad \cancel{-7.720}$$

27.) $\log_5(2x-7) = \log_5(3x-9)$

$\cancel{2 = x}$

No solution

$\emptyset$

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40.) $4\ln(-x) + 3 = 21$

$$\ln(-x) = \frac{18}{4}$$

$$e^{\ln(-x)} = e^{\frac{9}{2}}$$

$$-x = e^{9/2}$$

$$x = -e^{9/2}$$

$$x = -90.017$$

33.) $5\ln x = 35$

$e^{\ln x} = e^{7}$

$x = e^{7}$

$x = 1096.633$

37.) $\log_2 x + \log_2 (x-2) = 3$

$$\log_2 (x^2 - 2x) = 3$$

$$2^{} \qquad\qquad 2$$

$$x^2 - 2x = 8$$

$$x^2 - 2x - 8 = 0$$

$$(x-4)(x+2) = 0$$

$$x = 4, \cancel{-2}$$

Solve.

1 $3^x(27)^{x-1} = 9(81)^{2x+3}$

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

$3^x \cdot 3^{3x-3} = 3^2 \cdot 3^{8x+12}$

$4x-3 = 8x+14$

$-17 = 4x$

$\frac{-17}{4} = x$

2

$$4\sqrt{128} = 2^{3x}$$

$$4 \cdot 128^{1/2} = 2^{3x}$$

$$2^2 \cdot 2^{7/2} = 2^{3x}$$

$$2^{2+\frac{7}{2}} = 2^{3x}$$

$$\frac{11}{2} = 3x$$

$$\boxed{\frac{11}{6} = x}$$

3

$$\frac{100}{4+e^{3x}} = \frac{3}{1}$$

$$12 + 3e^{3x} = 100$$

$$3e^{3x} = 88$$

$$\ln e^{3x} = \ln \frac{88}{3}$$

$$3x = \ln \frac{88}{3}$$

$$x = \frac{\ln \frac{88}{3}}{3} = \frac{1}{3} \ln \frac{88}{3} = 1.126$$

4 $\log_{12}(x^2-7)=\log_{12}(x+5)$

$12 \qquad\qquad 12$

$x^2-7=x+5$

$x^2-x-12=0$

$(x-4)(x+3)=0$

$\checkmark \boxed{x=4,-3}$

5 $\log_4(3x+1) - \log_4(x-4) = \log_4 2$

$$4^{\log_4 \frac{3x+1}{x-4}} = 4^{\log_4 2}$$

$$\frac{3x+1}{x-4} = 2$$

$$\cancel{x = -9}$$

No solution

6 If $f(x) = \log_2 \sqrt[3]{x+3}$, find $f^{-1}(2)$

$$2 = \log_2 \sqrt[3]{x+3}$$

$$2^2 = 2^{\log_2 \sqrt[3]{x+3}}$$

$$4 = \sqrt[3]{x+3}$$

$$64 = x+3$$

$$61 = x$$

7 $f(x) = 3^{4x}$ find $f^{-1}(7)$

$$\log(7) = \log(3^{4x})$$

$$\log 7 = 4x \cdot \log 3$$

$$\frac{1}{4} \cdot \frac{\log 7}{\log 3} = x$$

$$.443 = x$$