4.4 Solving Exponential and Logarithmic equations

Solve for x; $x^2 = 4$; $x^2 - 4 = 0$

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

$\boxed{x = \pm 2}$ Solving polynomial.

$x^2 = 4$

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

$|x| = 2$

$x = \pm 2$ ✓

$2^x = 4 = 2^2$

$2^x = 2^2 \therefore \boxed{x = 2}$

$a^x = a^y$ then $x = y$.

$\log_4 x - \log_4 8 = 0$

$\log_4 x = \log_4 8$

$x = 8$

$\log_a x = \log_a y$ then $x = y$.

$x, y > 0$

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

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

$\log_3 3^{-x} = \log_3 3^2$

$\rightarrow -x = 2 \therefore \boxed{x = -2}$

Apply e

$\ln x = -3$

$e \qquad e$

$\boxed{x = e^{-3}} = 1/e^3$

$\log_3 x = 4$

$3 \qquad 3$

$x = 3^4 = \boxed{81}$ ✓

$\ln e^x = \ln 72$

$\ln \qquad \ln$

$\boxed{x = \ln 72}$

$3(2^x) = 42$

$2^x = 14$

$\log_2 \qquad \log_2$

$x = \log_2 14 = \frac{\ln 14}{\ln 2}$

$\ln 2^x = \ln 14$

$\ln \qquad \ln$

$x \ln 2 = \ln 14$

$x = \frac{\ln 14}{\ln 2} = 3.81$

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

$4e^{2x} = 5$

$e^{2x} = \frac{5}{4}$

$\ln \qquad \ln$

$2x = \ln 5/4$

$x = \frac{1}{2} \ln 5/4 = \ln \sqrt{5/4}$

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#72

$$e^{2x} - 5e^x + 6 = 0$$

$$(e^x - 2)(e^x - 3) = 0$$

$e^x - 2 = 0$ or $e^x - 3 = 0$

$e^x = 2$ or $e^x = 3$.

$x = \ln 2$ or $x = \ln 3$.

$\{\ln 2, \ln 3\}$.

#74 $e^{2x} = e^{x^2-8}$ $\longrightarrow$ $2x = x^2 - 8$

$a^x = a^y$, $x = y$

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

$x = 4, -2$

#78 $\dfrac{525}{1 + e^{-x}} = 275.$

Cross-multi

$525 = 275 + 275e^{-x}$

$-275 \quad -275$

$250 = 275e^{-x}$

$e^{-x} = \dfrac{250}{275} = \dfrac{10}{11}$

$-x = \ln \dfrac{10}{11}$

$x = -\ln 10/11 = \ln 11/10 = \ln 11 - \ln 10$ ✓

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Hw #36, 46, 56, 66, 80