EXPONENTIAL EQUATIONS (PART II)

Solve for x $\qquad 2^x = 8$

1) $2^x = 3$ $\qquad M = N \Rightarrow \log_b M = \log_b N$

$\ln 2^x = \ln 3$ $\qquad \log_b x^n = n \cdot \log_b x$

$x \cdot \ln 2 = \ln 3$ magic!

$$\boxed{x = \frac{\ln 3}{\ln 2}}$$

check: $2^{\frac{\ln 3}{\ln 2}} = 3$

2) $7 \cdot 2^x = 4 \Rightarrow 2^x = \frac{4}{7} \Rightarrow \log 2^x = \log\left(\frac{4}{7}\right)$

$$\Rightarrow x \log 2 = \log\left(\frac{4}{7}\right) \Rightarrow x = \frac{\log(4/7)}{\log 2}$$

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

$$\Rightarrow (x-1)\ln 3 = (2x+3)\ln 5$$

$$\rightarrow x \cdot \ln 3 - \ln 3 = 2(\ln 5) \cdot x + 3\ln 5$$

$$x \ln 3 - 2(\ln 5)x = \ln 3 + 3\ln 5$$

$$x(\ln 3 - 2\ln 5) = \ln 3 + 3\ln 5$$

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

47) $9^x + 2 \cdot 3^x - 15 = 0$

$9 = 3^2$ $\quad (3^2)^x + 2 \cdot 3^x - 15 = 0$

$(x^n)^m = x^{n \cdot m} = x^{m \cdot n} = (x^m)^n$

$(3^x)^2 + 2 \cdot 3^x - 15 = 0$

$(3^x + 5)(3^x - 3) = 0$

$3^x + 5 = 0$ or $3^x - 3 = 0$

$3^x = -5$ or $3^x = 3$

No solution $\quad x = 1$

$y^2 + 2y - 15 = 0$

$\bullet = -15 \quad | \quad 5, -3$

$+ = 2$

$(y+5)(y-3) = 0$

$y + 5 = 0$ or $y - 3 = 0$

$y = -5$ or $y = 3$