

Example 1: Solve $3 \log_2 x = -\log_2 125$

$$x^3 = 125^{-1} = (5^3)^{-1} = 5^{-3} = \left(\frac{1}{5}\right)^3$$

$$x^3 = \left(\frac{1}{5}\right)^3$$

$$x = \frac{1}{5}$$

Example 2: Solve $\log_4 (x^2 - 9) - \log_4 (x + 3) = 3$

$$\log_4 \frac{(x^2 - 9)}{(x + 3)} = 3$$

$$4^3 = \frac{(x^2 - 9)}{(x + 3)}$$

$$64x + 192 = x^2 - 9$$

$$0 = x^2 - 64x - 201$$

$$X = 67 \text{ or } -3$$

But -3 does not work, so $x = 67$

Example 3: An equation which is "quadratic" in form...

Solve: $3^{2x} + 3^x - 2 = 0$

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

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

$$(M - 2)(M + 1) = 0$$

$$M = 2 \text{ or } M = -1$$

$$3^{2x} = 2 \text{ or } 3^x = -1$$

$$x = \pm\sqrt{2}$$

Example 4: Solve $9^x - 8 \cdot 3^x - 9 = 0$

$$(3^2)^x - 2^3 \cdot 3^x - 3^2 = (3^x)^2 - 8 \cdot 3^x - 9 = M^2 - 8M - 9$$

$$= (M - 9)(M + 1)$$

$$M = 9 \text{ or } M = -1$$

$$3^x = 9 \text{ or } 3^x = -1$$

$$X = 2$$

Example 5: $2^{x+1} = 5^{1-2x}$

$$\ln 2^{x+1} = \ln 5^{1-2x}$$

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

$$x\ln 2 + \ln 2 = \ln 5 - 2x\ln 5$$

$$x\ln 2 + 2x\ln 5 = \ln 5 - \ln 2$$

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

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

$$x = .2342$$

Example 6: Use your graphing calculator to solve $e^{2x} = x + 2$

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

$$X = .4475, x = -1.9810$$