

SOLVING LOGARITHMIC AND EXPONENTIAL EQUATIONS

1. $\log_x 64 = 6$

$$x^6 = 64$$

$$x^6 = 2^6$$

$$x = 6$$

2. $\log_3 81 = x + 8$

$$3^{(x+8)} = 81$$

$$3^{x+8} = 3^4$$

$$x+8 = 4$$

$$x = -4$$

~~PSM~~

3. $\log(x+5) = 0$

$$x = -4 \checkmark$$

$$\log \frac{3x}{2(x-2)} = 0$$

4. $\log_8 3x = \log_8 2 + \log_8 (x-2)$

$$\log_8 3x = \log_8 2(x-2)$$

$$3x = 2x - 4$$

$$x = \cancel{4} \quad \underline{\text{No. Solution}}$$

$$5. \ln e^4 = x$$

$$e^x = e^4$$

$$\boxed{x=4}$$

$$6. \log_5(5x+9) = \log_5 6x$$

same
equal

$$5x+9=6x$$

$$\boxed{9=x}$$

$$7. \log_2 x + \log_2(x-2) = 3$$

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

$$2^3 = x^2 - 2x$$

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

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

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

$$\boxed{x=4 \text{ or } -2}$$

$$8. \log x + \log(x+2) = \log 35$$

$$\log_{10} x(x+2) = \log_{10} 35$$

$$x^2 + 2x = 35$$

$$x^2 + 2x - 35 = 0$$

$$(x+7)(x-5) = 0$$

$$x = -7 \text{ or } 5$$

$$9. \ln(2x+3) = \ln(x+2) - \ln x$$

$$\ln(2x+3) = \ln \frac{(x+2)}{x}$$

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

$$2x^2 + 3x = x + 2$$

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

no cal

$$x^2 + x - 1 = 0$$

$$10. e^{2x} - e^x - 6 = 0$$

"u" substituting

$$u = e^x$$

$$u^2 = e^{2x}$$

$$u^2 - u - 6 = 0$$

$$(u-3)(u+2) = 0$$

$$u = 3$$

$$u = -2$$

$$e^x = 3 \rightarrow \ln e^3 = x \rightarrow x = 1.099$$

$$e^x = -2$$

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

$$11. 2e^{2x} + 3e^x - 2 = 0$$

$$u = e^x$$

$$u^2 = e^{2x}$$

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

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

$$u = -2$$

$$e^x = -2$$

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

$$u = \frac{1}{2}$$

$$e^x = \frac{1}{2}$$

$$\ln \left(\frac{1}{2}\right) = x$$

$$x \approx -0.693$$

$$12. e^x + 4e^{-x} - 32 = 0$$

$$u = e^x$$

$$u^2 = e^{2x}$$

$$u = e^{-x}$$

Dmit

$$13. 3^x + 2 = 6$$

$$3^x = 4$$

$$x = \frac{\log 4}{\log 3}$$

$$\log_3 4 = x$$

$$x \approx 1.262$$

$$14. 6^{3x-1} - 5 = 30$$

$$6^{3x-1} = 35$$

$$\log 35 = 3x-1$$

$$1.984 \approx 3x-1$$

$$\boxed{995 \approx x}$$

$$15. 10e^x - 15 - 45e^{-x} = 0$$

Omit

$$16. \log_6(x^2 + 5) = \log_6 41$$

$$x^2 + 5 = 41$$

$$x^2 = 36$$

$$x = \pm 6$$

$$17. 3^{4x+3} = 8^{-x+2}$$

$$\log [3^{4x+3}] = \log [8^{-x+2}]$$

$$(4x+3) \log 3 = (-x+2) \log 8$$

$$4x(\log 3) + 3(\log 3) = -x(\log 8) + 2\log 8$$

$$4x(\log 3) + x(\log 8) = 2\log 8 - 3\log 3$$

~~18~~

$$x(4\log 3 + \log 8) = 2\log 8 - 3\log 3$$

$$x(\log \frac{64}{27}) = \log \frac{8}{3^3}$$

$$x = \frac{\log \frac{64}{27}}{\log 648}$$

$$\approx 0.133$$

glue