

Notes Section 3.4 - Exponential and Logarithmic Equations

• Solve, round to nearest hundredth.

1. $4^{x+2} = 16^{x-3}$

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

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

$$x+2 = 2x-6$$

$$\boxed{8 = x}$$

2. $(\frac{1}{3})^n = (\frac{1}{81})^{2/3}$

$$(\frac{1}{3})^n = (\frac{1}{3})^{4(2/3)}$$

$$n = 4(2/3)$$

$$\boxed{n = 8/3}$$

3. $2 \ln x = 18$

$$\ln x = 9$$

$$e^9 = x$$

$$\boxed{x = 8103.08}$$

4. $7 - 3 \log_{10} x = 13$

$$-3 \log_{10} x = 6$$

$$\log_{10} x = -2$$

$$10^{-2} = 10x$$

$$\frac{1}{100} = 10x$$

$$\boxed{x = \frac{1}{1000}}$$

$$5. \log_5 X^4 = 20$$

$$4 \log_5 X = 20$$

$$\log_5 X = 5$$

$$5^5 = X$$

$$\boxed{X = 3125}$$

$$6. \log_2 5 = \log_2 10 - \log_2 (X-4)$$

$$\log_2 5 = \log_2 \frac{10}{(X-4)}$$

$$5 = \frac{10}{(X-4)}$$

$$5(X-4) = 10$$

$$5X - 20 = 10$$

$$5X = 30$$

$$\boxed{X = 6}$$

$$7. \log_5 (X^2 + X) = \log_5 20$$

$$X^2 + X = 20$$

$$X^2 + X - 20 = 0$$

$$(X+5)(X-4) = 0$$

$$\boxed{X = -5 \quad X = 4}$$

$$8. 3^X = 7$$

$$\log 3^X = \log 7$$

$$X \log 3 = \log 7$$

$$X = \frac{\log 7}{\log 3}$$

$$\boxed{X = 1.77}$$

$$9. e^{2x+1} = 8$$

$$(2x+1) \ln e = \ln 8$$

$$2x+1 = 2.08$$

$$2x = 1.08$$

$$\boxed{x = .54}$$

$$10. 3^{6x-3} = 2^{4-4x}$$

$$(6x-3) \log 3 = (4-4x) \log 2$$

$$6x \log 3 - 3 \log 3 = 4 \log 2 - 4x \log 2$$

$$6x \log 3 + 4x \log 2 = 4 \log 2 + 3 \log 3$$

$$x(6 \log 3 + 4 \log 2) = 4 \log 2 + 3 \log 3$$

$$x = \frac{4 \log 2 + 3 \log 3}{6 \log 3 + 4 \log 2}$$

$$\boxed{x = .65}$$

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

$$(e^x - 2)(e^x + 1) = 0$$

$$e^x - 2 = 0 \quad e^x + 1 = 0$$

$$e^x = 2 \quad e^x = -1$$

$$x \ln e = \ln 2 \quad x \ln e = \ln(-1)$$

$$x = \ln 2$$

no sol.

$$\boxed{x = .69}$$

$$12. \log x + \log(x-3) = \log 28$$

$$\log x(x-3) = \log 28$$

$$x(x-3) = 28$$

$$x^2 - 3x - 28 = 0$$

$$(x-7)(x+4) = 0$$

$$\boxed{x=7} \quad x \neq -4$$

$$13. \log(3x-4) = 1 + \log(2x+3)$$

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

$$\log \frac{3x-4}{2x+3} = \log 10$$

$$\frac{3x-4}{2x+3} = 10$$

$$3x-4 = 10(2x+3)$$

$$3x-4 = 20x+30$$

$$-34 = 17x$$

$$x = -2$$

no solution