

$$1. \quad 64^{\frac{1}{2}} \times (\sqrt[3]{512})^4 \\ 2^{6 \times \frac{1}{2}} \times [2^{\frac{9 \times 1}{3}}]^4 = 2^3 \times [2^3]^4 = 2^3 \times 2^{3 \times 4} = 2^3 \times 2^{12} = 2^{3+12} = \underline{\underline{2^{15}}}$$

$$2. \quad \left[\sqrt{\frac{256}{\sqrt{16}}} \right]^2 = \left[\frac{4^4}{4^{2 \times \frac{1}{2}}} \right]^2 = \left[\frac{4^4}{4} \right]^2 = \frac{4^4}{4} = 4^{4-1} = \underline{\underline{4^3}}$$

$$3. \quad \frac{2 \times 16^x}{2} = \frac{4^2 \times 8^{3x+2}}{2}$$

$$16^x = 2 \times 8^{3x+2}$$

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

$$2^{4x} = 2 \times 2^{9x+6}$$

$$2^{4x} = 2^{9x+7}$$

$$4x = 9x+7 \quad -7 = 5x \quad x = \underline{\underline{-7/5}}$$

$$4. \quad 125^{2x} = \frac{5^{x-3}}{625}$$

$$5^{3(2x)} = 5^{x-3} \div 5^4$$

$$5^{6x} = 5^{x-3-4}$$

$$6x = x-7$$

$$5x = -7 \quad x = \underline{\underline{-7/5}}$$

$$5. \quad 6^{x+3} = 17$$

$$x+3 \log 6 = \log 17$$

$$x+3 = \log 17 / \log 6 = 1.5812$$

$$x = -1.4187 = \underline{\underline{-1.42}}$$

$$6. \quad \begin{array}{ccc} 100\% & 50\% & 25\% \\ 1 & \rightarrow \frac{1}{2} & \rightarrow \frac{1}{2} \end{array}$$

$$2 \text{ half lives} = 30 \text{h}$$

$$1 \text{ half life} = 15 \text{ hours}$$

$$7. \quad \log_4 512 + \log_4 8$$

$$512 = 2 \times 4^4$$

$$8 = 2 \times 4$$

$$\log_4 512 + \log_4 8 = \log_4 (512 \times 8) = \log_4 4096 \quad 4^x = 4096 = 4^6$$

$$8. \log_8 768 + \log_8 16 - \log_8 2$$

$$\log_8 \left[\frac{768 \times 16}{2} \right] = \log_8 (4096)$$

$$8^x = 4096 = 8^4$$

$$x = 4$$

$$9. \log_8 256 + \log_8 4 - \log_8 7 + \log_8 224$$

$$\log_8 \left(\frac{256 \times 4 \times 224}{7} \right)$$

$$8^x = 32768$$

$$x = 5$$

$$10. 2 \log (2x+3) - \log 2x^2 + 9x + 9$$

$$\frac{\log (2x+3)^2}{2x^2 + 9x + 9} = 0$$

$$\frac{(2x+3)^2}{2x^2 + 9x + 9} = 0 \quad 4x^2 + 12x + 9 = 0$$

$$4x^2 + 12x + 9 = 4x^2 + 6x + 6x + 9 = 0$$

$$P = 36$$

$$S = 12$$

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

$$(2x+3)(2x+3) = 0 \quad 2x = -3 \quad x = -3/2 \quad x = 7 - 3/2$$

$$11. \frac{\log_6 46656}{\log_2 8} = \log_x 256 = \frac{6}{3}$$

$$x^{1/2} = 256$$

$$x = 256^2 = 65536$$

$$12. \log_2 \sqrt{x-1} = 2$$

$$\sqrt{x-1} = (2)^2$$

$$x-1 = 4 \Rightarrow x = 5$$

$$\log_2 2$$

$$2^2 = \sqrt{x-1}$$

$$4^2 = x-1$$

$$16 = x-1$$

$$x = 17$$

$$13. \log_2 \sqrt{5x+1} = 4$$

$$(2^4)^2 = (\sqrt{5x+1})^2$$

$$256 = 5x+1$$

$$\frac{255}{5} = \frac{5x}{5} \quad x = 51$$

$$14. \log_2 \sqrt{2x^2+4x} = 4$$

$$2^4 = 2x^2+4x$$

$$2x^2+4x-16=0$$

$$p=32$$

$$s=4$$

$$2x^2+8x-4x-16=0$$

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

$$(2x-4)(x+4) \quad x = \frac{-4}{2} \quad \checkmark$$

$$x = 2 \quad \checkmark$$

$$16. \log_6 (x^2+19x+124) = 3$$

$$6^3 = x^2+19x+124$$

$$216 = x^2+19x+124 \Rightarrow x^2+19x-92=0$$

$$x^2+23x-4x-92=0$$

$$x(x+23)-4(x+23)=0$$

$$(x-4)(x+23)=0 \quad x=4, x=-23$$

$$15. \log_5 (x^2+2x+17) = 2$$

$$5^2 = x^2+2x+17$$

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

$$x^2+4x-2x-8=0$$

$$x(x+4)-2(x+4)=0 \Rightarrow (x-2)(x+4) \quad x=2, x=-4$$

$$17. \log_2 (2x-1) - \log_2 (x+4) = 2$$

$$\log_2 \frac{2x-1}{x+4} = 2$$

$$\frac{2x-1}{x+4} = 4$$

$$2x-1 = 4x+16$$

$$-17 = 2x \quad x = \frac{-17}{2}$$

$$18. 1 + \log(2x-3) = \log(3x-2)$$

$$1 = \log \frac{3x-2}{2x-3}$$

but $1 = \log 10$

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

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

$$x = -1$$

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

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

$$3x-2 = 20x-30$$

$$28 = 17x \quad x = \frac{28}{17} = 28/17$$

$$19. \log 3x^2 - 12 - \log(x+2) = \log 6$$

$$\log \frac{3x^2 - 12}{x+2} = \log 6$$

$$\frac{3x^2 - 12}{x+2} = 6$$

$$3x^2 - 12 = 6x + 12$$

$$3x^2 - 6x - 24 = 0$$

$$3x^2 - 12x + 6x - 24 = 0$$

$$3x(x-4) + 6(x-4) = 0$$

$$(3x+6)(x-4) = 0 \quad x=4, x=2$$

$$20. \log_4 x^2 - 9x + 18 - \log_4(x-3) = 2$$

$$\log_4 \frac{x^2 - 9x + 18}{x-3} = 2 \log_4 4$$

$$\frac{x^2 - 9x + 18}{x-3} = 16$$

$$x^2 - 9x + 18 = 16x - 48$$

$$x^2 - 25x + 66 = 0$$

$$x^2 - 22x - 3x + 66 = 0$$

$$x(x-22) - 3(x-22) = 0$$

$$(x-3)(x-22) = 0 \quad x=22 \quad x=3$$