

### 3-3 HW

$$1. \log_{10} 7 \cdot 5 = \log_{10} 7 + \log_{10} 5 = 0.8451 + 0.6990 = 1.5441$$

$$2. \log_{10} 25 = \log_{10} 5^2 = 2 \log_{10} 5 = 2(0.6990) = 1.398$$

$$3. \log_{10} \frac{7}{5} = \log_{10} 7 - \log_{10} 5 = 0.8451 - 0.6990 = 0.1461$$

$$4. \log_{10} \frac{5}{7} = \log_{10} 5 - \log_{10} 7 = 0.6990 - 0.8451 = -0.1461$$

$$5. \log_{10} 245 = \log_{10} 7 \cdot 7 \cdot 5 = \log_{10} 7 + \log_{10} 7 + \log_{10} 5 = 2(0.8451) + 0.6990 = 2.3892$$

$$6. \log_{10} 175 = \log_{10} 5^2 \cdot 7 = 2 \log_{10} 5 + \log_{10} 7 = 2(0.6990) + 0.8451 = 2.2431$$

$$7. \log_{10} 0.2 = \log_{10} \frac{2}{10} = \log_{10} \frac{7}{35} = \log_{10} \frac{7}{7(5)} = \log_{10} 7 - \log_{10} 7 \cdot 5 = \\ \log_{10} 7 - (\log_{10} 7 + \log_{10} 5) = \\ 0.8451 - (0.8451 + 0.6990) = \\ -0.699$$

$$8. \log_{10} \frac{25}{7} = \log_{10} \frac{5^2}{7} = \log_{10} 5^2 - \log_{10} 7 = 2 \log_{10} 5 - \log_{10} 7 \\ = 2(0.6990) - 0.8451 \\ 0.5529$$

$$9. \log_7 n = \log_7 8^{2/3} \quad 10. \log_{10} u = \log_{10} 4^{3/2} \quad 11. \log_6 9x = \log_6 54$$

$$n = 8^{2/3}$$

$$\boxed{n = 4}$$

$$u = 4^{3/2}$$

$$\boxed{u = 8}$$

$$9x = 54$$

$$\boxed{x = 6}$$

$$12. \log_8 \frac{48}{w} = \log_8 4$$

$$\frac{48}{w} = 4$$

$$48 = 4w$$

$$\boxed{w = 12}$$

$$13. \log_9 \frac{3u+14}{5} = \log_9 2u$$

$$\frac{3u+14}{5} = 2u$$

$$3u+14 = 10u$$

$$14 = 7u$$

$$\boxed{2 = u}$$

$$14. \log_2 5x^4 = \log_2 405$$

$$5x^4 = 405$$

$$x^4 = 81$$

$$\boxed{x = 3}$$

$$15. \log_3 y = \log_3 16^{-1} \cdot 64^{1/3}$$

$$y = 16^{-1} \cdot 64^{1/3}$$

$$\boxed{y = 1/4}$$

$$16. \log_2 d = \log_2 \frac{2^5}{8}$$

$$d = \frac{2^5}{8}$$

$$\boxed{d = 4}$$

$$17. \log_{10} m(3m-5) = \log_{10} 2$$

$$m(3m-5) = 2$$

$$3m^2 - 5m - 2 = 0$$

$$(3m+1)(m-2) = 0$$

$$m = -1/3 \quad \boxed{m = 2}$$

$$18. \log_{10} b(b+3) = \log_{10} 4$$

$$b(b+3) = 4$$

$$b^2 + 3b - 4 = 0$$

$$(b+4)(b-1) = 0$$

$$b = -4 \quad \boxed{b = 1}$$

$$19. \log_8 \frac{t+10}{t-1} = \log_8 12$$

$$\frac{t+10}{t-1} = 12$$

$$t+10 = 12t-12$$

$$22 = 11t$$

$$\boxed{2 = t}$$

$$20. \log_3 (a+3)(a+2) = \log_3 6$$

$$a^2 + 5a + 6 = 6$$

$$a^2 + 5a = 0$$

$$a(a+5) = 0$$

$$\textcircled{a=0} \quad a = \cancel{5}$$

$$22. \log_4 \frac{(x^2-4)}{x+2} = \log_4 1$$

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

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

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

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

$$\textcircled{x=3} \quad x = \cancel{2}$$

$$24. \log_8 (n-3)(n+4) = 1$$

$$8^1 = n^2 + 1n - 12$$

$$0 = n^2 + 1n - 20$$

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

$$n = \cancel{5} \quad \textcircled{n=4}$$

$$21. \log_{10} \frac{r+4}{r} = \log_{10} (r+1)$$

$$\frac{r+4}{r} = r+1$$

$$r+4 = r^2+r$$

$$0 = r^2 - 4$$

$$0 = (r+2)(r-2)$$

$$\textcircled{r=2} \quad r = \cancel{2}$$

$$23. \log_{10} 4w = 2$$

$$10^2 = 4w$$

$$100 = 4w$$

$$\textcircled{25 = w}$$

$$25. \log_5 (x^2+9)^3 = 6$$

$$5^6 = (x^2+9)^3$$

$$15625 = (x^2+9)^3$$

$$25 = x^2+9$$

$$0 = x^2 - 16$$

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

$$\textcircled{x=4} \quad \textcircled{x=-4}$$

$$26. \log_{16} \left( \frac{9x+5}{x^2-1} \right) = \frac{1}{2}$$

$$16^{1/2} = \frac{9x+5}{x^2-1}$$

$$4(x^2-1) = 9x+5$$

$$4x^2-4 = 9x+5$$

$$4x^2-9x-9=0$$

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

$$x = -\frac{3}{4} \quad x = 3$$

$$27. \log_6 (2x-5) - \log_6 (7x+10) = -1$$

$$\log_6 \frac{2x-5}{7x+10} = -1$$

$$6^{-1} = \frac{2x-5}{7x+10}$$

$$\frac{1}{6} = \frac{2x-5}{7x+10}$$

$$7x+10 = 12x-30$$

$$40 = 5x$$

$$8 = x$$

$$28. \log_2 (5y+2) - \log_2 (1-2y) = 1$$

$$\log_2 \frac{5y+2}{1-2y} = 1$$

$$2^1 = \frac{5y+2}{1-2y}$$

$$2-4y = 5y+2$$

$$0 = 9y \quad y = 0$$

$$29. \log_{10} (c^2-1) - \log_{10} (c+1) = 2$$

$$\log_{10} \frac{c^2-1}{c+1} = 2$$

$$10^2 = \frac{c^2-1}{c+1}$$

$$100c + 100 = c^2 - 1$$

$$0 = c^2 - 100c - 101$$

$$0 = (c+1)(c-101)$$

$$c \neq -1 \quad c = 101$$

$$30. \log_7 x + \log_7 x^2 - \log_7 3 = \log_7 72$$

$$\log_7 \frac{x^3}{3} = \log_7 72$$

$$\frac{x^3}{3} = 72$$

$$x^3 = 216$$

$$\boxed{x = 6}$$

$$31. \text{ Let } R = 10 \text{ so tripled } \rightarrow R = 30$$

$$L = 10 \log_{10} R$$

$$L_1 = 10 \log_{10} 10$$

$$L_2 = 10 \log_{10} 30$$

$$L_2 - L_1 = 10 \log_{10} 30 - 10 \log_{10} 10$$

$$10 \log_{10} 30^{10} - 10 \log_{10} 10^{10}$$

$$10 \log_{10} \frac{30^{10}}{10^{10}} = 4.8 \text{ dB}$$

$$32. 4.5 = \log_{10} x$$

$$3.5 = \log_{10} x$$

$$10^{3.5} = x \quad 10^{4.5} = x$$

$$3162.27 \quad 31622.77$$

about 10 times