

1. $y = \left(\frac{1}{2}\right)^x$

x	y
0	1
1	$\frac{1}{2}$
2	$\frac{1}{4}$
-1	2
-2	4

2. $g(t) = 14.16(1.048)^t$

(a) $t = 14$

$$g(14) = 14.16(1.048)^{14}$$

$$= 27.3$$

(b) $t = 24$

$$g(24) = 14.16(1.048)^{24}$$

$$= 43.62$$

3. $W(t) = 45 - 30e^{-0.5t}$

$$(a) W(0) = 45 - 30e^{-0.5(0)} = 15$$

$$(b) W(1) = 45 - 30e^{-0.5(1)} = 26.8 \approx 27$$

$$(c) W(4) = 45 - 30e^{-0.5(4)} = 40.9 \approx 41$$

$$(d) W(12) = 45 - 30e^{-0.5(12)} = 44.9 \approx 45$$

$$4. \log 0.001 = -3 \Rightarrow 10^{-3} = 0.001$$

$$5. e^{3.4965} = 33 \Rightarrow \log_e 33 = 3.4965$$

$$6. \log_5 625 = \log_5 5^4$$

$$= 4 \log_5 5 = 4$$

$$7. \ln(e) = 1$$

$$8. \log 70 = 1.8451$$

$$9. \ln(0.64) = -0.4463$$

$$10. 3\log x + 6\log y - 4\log z$$

$$\log x^3 + \log y^6 - \log z^4$$

$$= \log \left(\frac{x^3 y^6}{z^4} \right)$$

$$11. \ln \left(\frac{7y}{6z} \right)$$

$$= \ln(7y) - \ln(6z)$$

$$= \ln(7) + \ln(y) - \ln(6) - \ln(z)$$

$$12. \log_{33} 3973 = ~~3~~ 2.370158$$

$$13. f(x) = \ln(x) - 1$$

x	$f(x)$
1	-1
2	-0.307

3	0.099
0	2.718
2.718	0

14. $2 \ln(x-2) = \ln(x+4) + \ln 3$

$$\ln(x-2)^2 = \ln(3(x+4))$$

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

$$x^2 - 4x + 4 = 3x + 12$$

$$x^2 - 7x - 8 = 0$$

$$(x-8)(x+1) = 0$$

$$x = 8, -1$$

$$x = 8, 2 \ln(8-2) = \ln(8+4) + \ln(3) \quad \text{True}$$

$$x = -1, 2 \ln(-1-2) = \ln(-1+4) + \ln(3) \quad \text{False}$$

$$x = 8$$

15. $\log x + \log(x-21) = 2$

$$\log x + \log(x-21) = 2 \log 10$$

$$\log(x(x-21)) = \log(100)$$

$$= x^2 - 21x = 100$$

$$x^2 - 21x - 100 = 0$$

$$(x-25)(x+4) = 0$$

$$x = 25, -4$$

$$x = 25, \log(25) + \log(25-21) = 2 \quad \text{True}$$

$$x = -4, \log(-4) + \log(-4-21) = 2 \quad \text{False}$$

$$x = 25$$

16.

$$3^{-2x} = 27$$

$$3^{-2x} = 3^3$$

$$-2x = 3$$

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

$$17. \quad 3^{x+3} = 4^x$$

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

$$(x+3)\ln(3) = x\ln(4)$$

$$(x+3)\ln(3) = 2x\ln(2)$$

$$x\ln(3) + 3\ln(3) = 2x\ln(2)$$

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

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

$$x = \frac{-3\ln(3)}{\ln(3) - 2\ln(2)} = \frac{3\ln(3)}{\ln\left(\frac{4}{3}\right)}$$

$$= 11.457$$

$$18. \quad \log_2(x+7) + \log_2(x-7) = 5$$

$$\log_2(x+7) + \log_2(x-7) = 5\log_2 2$$

$$\log_2((x+7)(x-7)) = \log_2(2^5)$$

$$(x+7)(x-7) = 32$$

$$x^2 - 49 = 32$$

$$x^2 - 81 = 0$$

$$x = 9, x = -9$$

$$x = 9, \text{ True}$$

$$x = 9.$$

$$19. g(x) = 21.9(1.12)^x$$

$$(a) 90,000$$

$$90,000 = 21.9(1.12)^x$$

$$1.12^x = \frac{90000}{21.9}$$

$$\ln(1.12)^x = \ln\left(\frac{90000}{21.9}\right)$$

$$x \ln(1.12) = \ln\left(\frac{90000}{21.9}\right)$$

$$x = \frac{\ln\left(\frac{90000}{21.9}\right)}{\ln(1.12)} = 73.42$$
$$= 74 + 2000$$
$$= 2074$$

$$1b) 1.30000$$

$$130000 = 21.9 (1.12)^x$$

$$1.12^x = \frac{130000}{21.9}$$

$$\ln(1.12)^x = \ln\left(\frac{130000}{21.9}\right)$$

$$x = \frac{\ln\left(\frac{130000}{21.9}\right)}{\ln(1.12)} = 76.6 \approx 77$$

$$= 2000 + 77$$

$$= 2077$$

$$20. f(x) = 41.5 e^{0.089x}$$

$$(9) x = 9.$$

$$f(9) = 41.5 e^{0.089(9)} = 92.45$$