

1. a) $y = \left(\frac{1}{4}\right)^x$

b) $\log_2 \frac{1}{8} = -3$

c) $\log_7 9$

d) $x = -1$

2. the range of function $\rightarrow$ NO
 the domain of the function $\rightarrow$ NO
 the x -intercept of the function $\rightarrow$ YES
 the vertical asymptote $\rightarrow$ NO

3. a) $\log_3 \left(\frac{1}{27}\right)^4$
 $= 4 \log_3 \left(\frac{1}{27}\right)$
 $= 4 \log_3 3^{-3}$
 $= 4(-3) \log_3 3$
 $= 4(-3)(1)$
 $= \boxed{-12}$

b) $\log_8 \frac{1}{2}$
 $8^x = \frac{1}{2}$
 $2^{3x} = 2^{-1}$
 $3x = -1$
 $x = \boxed{-\frac{1}{3}}$

4. $\log_b x - \frac{1}{5} (\log_b y + 4 \log_b z)$
 $= \log_b x - \frac{1}{5} \log_b y - \frac{4}{5} \log_b z$
 $= \log_b x - \log_b y^{1/5} - \log_b z^{4/5}$
 $= \boxed{\log_b \left(\frac{x}{y^{1/5} z^{4/5}} \right)}$

restrictions: $x > 0, y > 0, z > 0$

$= \frac{1}{2} (2 \log_b x + \log_b y + 4 \log_b z)$
 $= \boxed{\log_b x + \frac{1}{2} \log_b y + 2 \log_b z}$
 restrictions: $x > 0, y > 0, z > 0$

5. $\log_b (x^2 y z^4)^{1/2}$
 $= \frac{1}{2} \log_b (x^2 y z^4)$
 $= \frac{1}{2} (\log_b x^2 + \log_b y + \log_b z^4)$

6. a) $y = -2\log(x+2)+1$
 $y = \log x ; 10^y = x$

b) domain : $[-2, \infty)$
 range : all real numbers

c) vertical asymptote : $x = -2$

d) $-2\log(x+2)+1=0$

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

$$\log(x+2) = -\frac{1}{2}$$

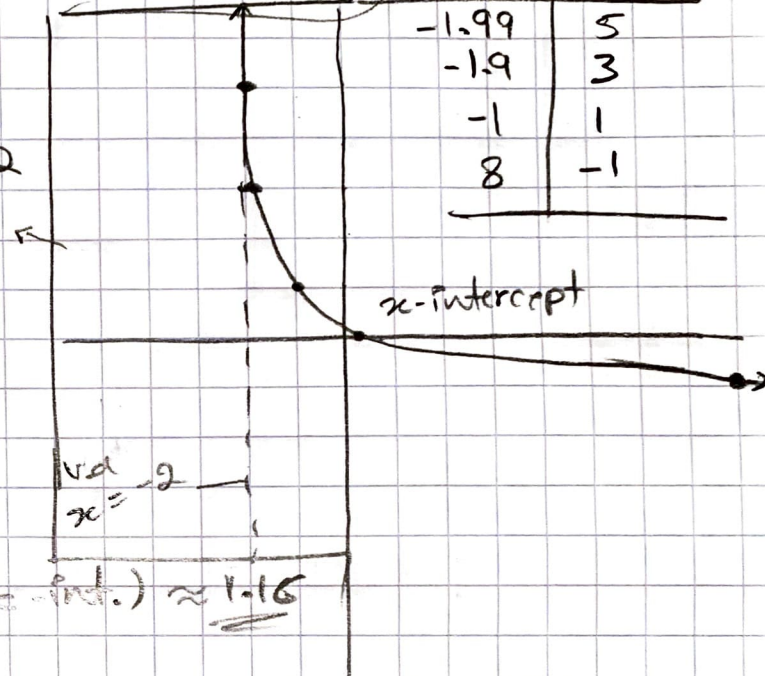
$$x+2 = 10^{-\frac{1}{2}}$$

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

$$x = -2 + \sqrt{10} \quad (x\text{-int.}) \approx \underline{\underline{1.16}}$$

x	y
0.01	-2
0.1	-1
1	0
10	1

$x-2$	$-2y+1$
-1.99	5
-1.9	3
-1	1
8	-1



7. a) $\log_3(6x+5) = 2$

$$3^2 = 6x+5$$

$$9-5 = 6x$$

$$6x = 4$$

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

b) $\log_2 x + \log_2(x+2) = 3$

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

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

$$x^2 + 2x = 8$$

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

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

$$x = -4 \text{ (extraneous root)}$$

$$\boxed{x = 2}$$

c) $3^{2x} = 5(3^x) + 14$

$$a^2 = 5a + 14$$

$$a^2 - 5a + 14 = 0$$

$$(a-7)(a+2) = 0$$

$$a = 7, -2$$

$$3^x = 7 \text{ or } 3^x = -2 \text{ (extraneous root)}$$

$$\boxed{x = \log_3 7}$$

$$d) \frac{\log(32 + x^2)}{\log(x+4)} = 2$$

$$\log(x+4) (32 + x^2) = 2$$

$$(x+4)^2 = 32 + x^2$$

$$x^2 + 8x + 16 = 32 + x^2$$

$$8x = 16$$

$$\boxed{x = 2}$$

$$8. - (x+2) > 0$$

$$x+2 < 0$$

$$x < -2$$

$$\text{domain: } (-\infty, -2)$$

$$9. 2000 \left(\frac{1}{2}\right)^{1/h} = 1516$$

*divide both sides by 2000

$$\left(\frac{1}{2}\right)^{1/h} = 0.758$$

$$\frac{1}{h} = \log_{0.5} 0.758$$

$$\frac{1}{h} = \frac{\log 0.758}{\log 0.5}$$

$$h = \frac{\log 0.5}{\log 0.758}$$

$$\boxed{h = 2.50 \text{ years (half-life)}}$$

$$10. \quad \frac{I_2}{I_1} = 10^{M_2 - M_1}$$

$$\frac{I_2}{I_1} = 10^{8.9 - 7} = 10^{1.9} \approx 79.43$$

times intense in Japan than in Haiti

$$11. \quad \beta_2 - \beta_1 = 10 \log \frac{I_2}{I_1}$$

$$58 - 55 = 10 \log \frac{I_2}{I_1}$$

* divide both sides by 10.

$$0.3 = \log \frac{I_2}{I_1}$$

$$\frac{I_2}{I_1} = 10^{0.3} \approx 2$$

∴ the teacher should say the class is 2 times louder when Rachan is present.

$$12. \quad \log 28 = \log (2^2)(7)$$

$$= \log (2^2) + \log 7$$

$$= 2 \log 2 + \log 7$$

$$= 2(0.3010) + 0.8451$$

$$= 1.4471$$

∴ calculated w/o the use of technology