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1. a) $4 = \log_3 81$

e) $-2 = \log 0.01$

2. a) $2^5 = 32$

e) $10^1 = 10$

3. a) 4

e) -2

4. a) 4

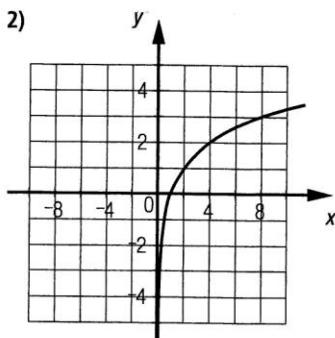
e) 10

5. a) 1)

$$f(x) = \log_2 x$$

x	y
$\frac{1}{8}$	-3
$\frac{1}{4}$	-2
$\frac{1}{2}$	-1
1	0
2	1
4	2
8	3

b) 2)



c) $\frac{3}{2} = \log_5 \sqrt{125}$

f) $3 = \log_{\frac{1}{3}} \frac{1}{27}$

b) $10^3 = 1000$

f) $5^0 = 1$

b) 3

f) -4

b) 100

f) $\frac{1}{81}$

b) 3

c) $4^{-1} = \frac{1}{4}$

g) $2^{-4} = \frac{1}{16}$

g) -3

g) 3

g) 3

d) $\frac{1}{2} = \log_{144} 12$

h) $-4 = \log_4 256$

d) $10^{-4} = 0.0001$

h) $3^4 = 81$

h) 1

d) 3

h) 1

d) $\frac{3}{2}$

h) $\sqrt{12}$

d) $\frac{1}{2} = \log_{144} 12$

h) $-4 = \log_4 256$

d) $10^{-4} = 0.0001$

h) $3^4 = 81$

h) 1

d) 3

h) 1

d) $\frac{3}{2}$

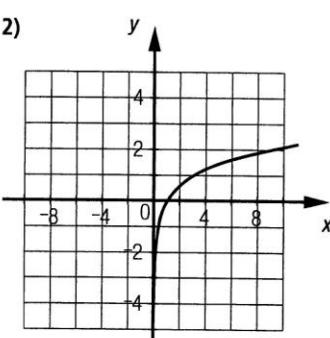
h) $\sqrt{12}$

b) 1)

$$g(x) = \log_3 x$$

x	y
$\frac{1}{27}$	-3
$\frac{1}{9}$	-2
$\frac{1}{3}$	-1
1	0
3	1
9	2
27	3

2)

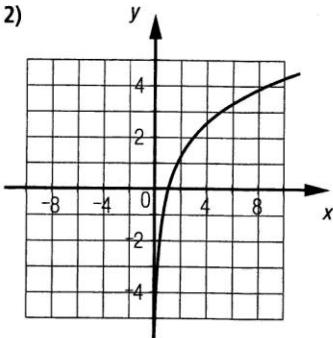


c) 1)

$$h(x) = 3 \log_5 x$$

x	y
$\frac{1}{125}$	-9
$\frac{1}{25}$	-6
$\frac{1}{5}$	-3
1	0
5	3
25	6
125	9

2)

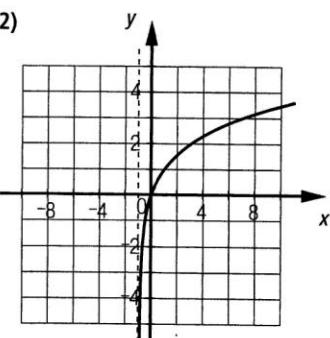


d) 1)

$$i(x) = \log_2(x+1)$$

x	y
$-\frac{7}{8}$	-3
$-\frac{3}{4}$	-2
$-\frac{1}{2}$	-1
0	0
1	1
3	2
7	3

2)

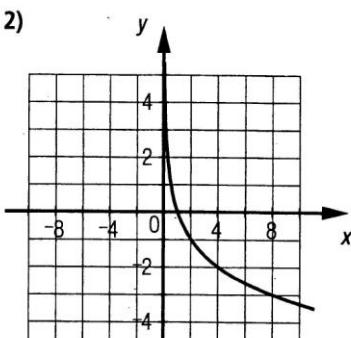


e) 1)

$$j(x) = \log_{\frac{1}{2}} x$$

x	y
$\frac{1}{8}$	3
$\frac{1}{4}$	2
$\frac{1}{2}$	1
1	0
2	-1
4	-2
8	-3

2)



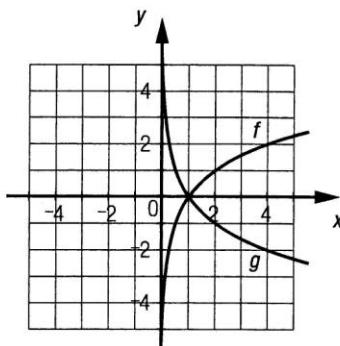
6. a) ≈ 1.49	b) ≈ 1.79	c) ≈ 0.40	d) ≈ 1.91
e) ≈ -0.69	f) ≈ 0.43	g) ≈ 2.30	h) ≈ -0.74

7. a) $f^{-1}(x) = \log_3 x$	b) $g^{-1}(x) = \log_{0.8}(x - 7)$	c) $h^{-1}(x) = \ln \frac{x}{3}$
d) $i^{-1}(x) = \log_{\frac{2}{9}}(x + 5) + 2$	e) $j^{-1}(x) = \log_{\frac{1}{3}} \frac{20}{3} x$	f) $k^{-1}(x) = 2 \ln \frac{x}{5}$
8. a) $f^{-1}(x) = 5^x$	b) $g^{-1}(x) = 10^{\frac{2x}{9}} + 3$	c) $h^{-1}(x) = e^{\frac{20x}{47}}$
d) $i^{-1}(x) = \frac{1}{2}(2)^{\frac{2}{15}(x - 5)}$	e) $j^{-1}(x) = 10^{2(x-1)} + 4$	f) $k^{-1}(x) = 2e^{2x}$

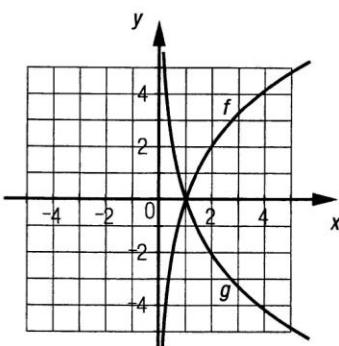
9.

Rule of the function	Base	Equation of the asymptote	Domain	Range
a) $f(x) = 2 \log_2 x$	2	$x = 0$	$]0, +\infty[$	\mathbb{R}
b) $g(x) = \log x$	10	$x = 0$	$]0, +\infty[$	\mathbb{R}
c) $h(x) = 3 \log_{1.5}(x - 4) + 2$	1.5	$x = 4$	$]4, +\infty[$	\mathbb{R}
d) $i(x) = \log_{0.5} x - 1$	0.5	$x = 0$	$]0, +\infty[$	\mathbb{R}
e) $j(x) = \ln x$	e	$x = 0$	$]0, +\infty[$	\mathbb{R}
f) $k(x) = -\log_3(x + 1) - 5$	3	$x = -1$	$]-1, +\infty[$	\mathbb{R}

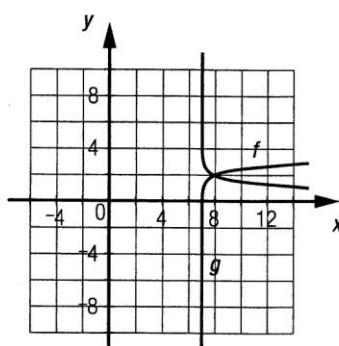
10. a) 1)



2)



3)



b) 1) A reflection about the x -axis.

3) A reflection about the axis with equation $y = 2$.

11. a) Increasing.

b) Decreasing.

c) Increasing.

d) Increasing.

e) Decreasing.

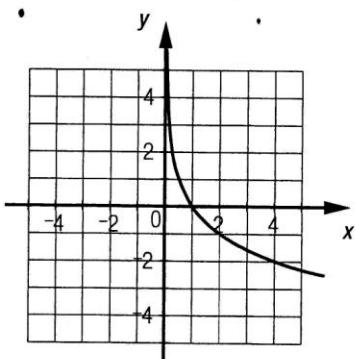
f) Increasing.

12. a) $f(x) = \log_2 \frac{1}{2}(x - 3)$	b) $f(x) = \log_{\frac{1}{2}}(x + 2)$	c) $f(x) = \log_{\frac{3}{2}}(x - 5)$
d) $f(x) = \log_7 -\frac{1}{3}(x + 7)$	e) $f(x) = \log_{\frac{2}{3}}(x - 8)$	f) $f(x) = \log_{\frac{1}{2}} \frac{1}{7}(x + 10)$

13.

Function	f	f^{-1}
Rule	$f(x) = -1.5(2)^x + 4$	$f^{-1}(x) = \log_2 \frac{2}{3}(-x + 4)$
Domain	\mathbb{R}	$]-\infty, 4[$
Range	$]-\infty, 4[$	\mathbb{R}

14. a) The two curves are superimposed.



b) $y = -\log_2 x \Leftrightarrow -y = \log_2 x$

$$\Leftrightarrow 2^{-y} = x$$

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

$$\Leftrightarrow y = \log_{\frac{1}{2}} x$$

15. a) 1) No initial value. 2) $x = 0$
 c) 1) No initial value. 2) $x = 0$
 e) 1) No initial value. 2) $x = 0$
- b) 1) The initial value is 3. 2) $x = 4$
 d) 1) No initial value. 2) $x = 5$
 f) 1) The initial value is 1. 2) $x = e$

16. Sound intensity according to acoustic pressure

Nature of the sound	Pression (Pa)	Intensity (dB)	Perception
Thunder	11.25	≈ 115	Dangerous
Fire alarm siren	35.56	≈ 125	Unbearable
Normal conversation	0.02	60	Normal
Beside a busy highway	1.12	≈ 94.96	Painful
Dance club	5.02	≈ 107.99	Dangerous
Rock concert	63.25	≈ 130	Unbearable

17. a) 1) 5000 volts. 2) $\approx 4.74 \times 10^{-15}$ volts.

b) 1) $t = -\frac{10}{83} \ln\left(\frac{v}{5000}\right)$ 2) $\approx 8.35 \times 10^{-2}$ ms

18. a) $[\text{H}^+] = 10^{-(\text{pH})}$

b) Characteristics of certain liquids

Liquid	$[\text{H}^+]$ (mol/L)	pH
Milk	≈ 1.74×10^{-7}	6.76
Orange juice	1.95×10^{-4}	≈ 3.71
Bleach	1.78×10^{-13}	≈ 12.75
Coffee	≈ 1.29×10^{-5}	4.89
Human blood	4.57×10^{-8}	≈ 7.34
Stomach acid	6.17×10^{-2}	≈ 1.21
Distilled water	1×10^{-7}	7
Tea	≈ 3.16×10^{-6}	5.5

19. a) $\approx 27.38 \text{ MJ}$

b) 1) $v = 4095 \ln 0.1(E + 10)$ **2)** $\approx 7337.26 \text{ RPM}$

20. a) $t = 2 \log_{\frac{1}{10}}\left(\frac{Q}{100}\right)$

b) $t = -2 \log\left(\frac{Q}{100}\right)$

c) $\approx 0.25 \text{ h}$ or $\approx 15 \text{ min.}$