

W1 - 6.1/6.2 - Intro to Logarithms and Review of Exponentials

MHF4U

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SOLUTIONS

1) Sketch a graph of each function. Then, sketch a graph of the inverse of each function. Label each graph with its equation.

a) $y = 2^x$

$f(x) = 2^x$

x	y
-2	0.25
-1	0.5
0	1
1	2
2	4

Find eqⁿ of $F^{-1}(x)$

$x = 2^y$

$\log x = \log 2^y$

$\log x = y \log 2$

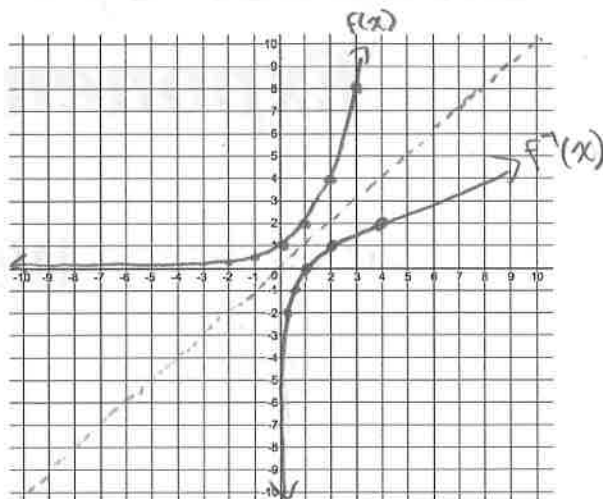
$\frac{\log x}{\log 2} = y$

$y = \log_2 x$

$F^{-1}(x) = \log_2 x$

$F^{-1}(x) = \log_2 x$

x	y
0.25	-2
0.5	-1
1	0
2	1
4	2



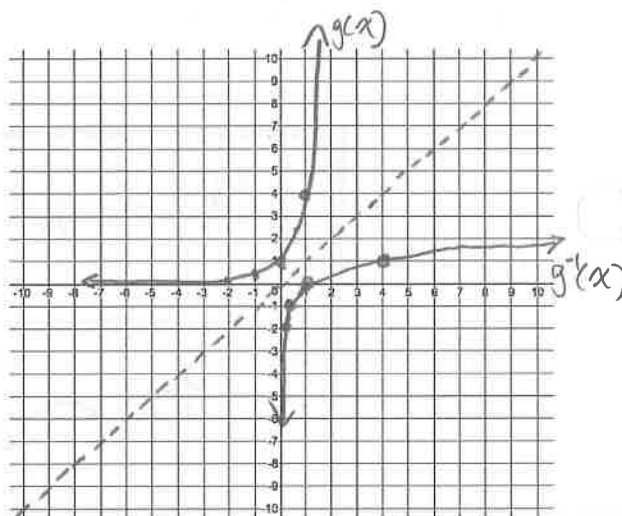
b) $y = 4^x$

$g(x) = 4^x$

x	y
-2	0.0625
-1	0.25
0	1
1	4
2	16

$g^{-1}(x) = \log_4 x$

x	y
0.0625	-2
0.25	-1
1	0
4	1
16	2



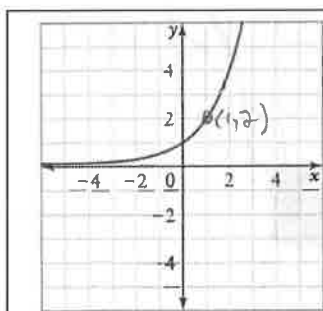
2) Match each equation to its corresponding graph.

A) $y = 5^x$

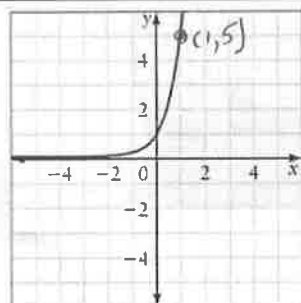
B) $y = \left(\frac{1}{2}\right)^x$

C) $y = 2^x$

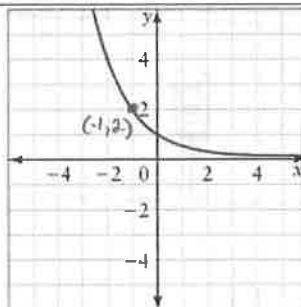
D) $y = \left(\frac{1}{5}\right)^x$



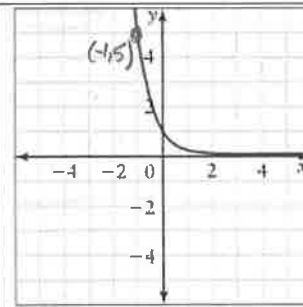
C



A



B



D

3) An influenza virus is spreading according to the function $N = 10(2)^t$, where N is the number of people infected and t is the time, in days.

How many people have the virus at each time?

i) initially, when $t = 0$

$$N = 10$$

ii) after 1 day

$$N = 10(2)^1 \\ = 20$$

iii) after 2 days

$$N = 10(2)^2 \\ = 40$$

iv) after 3 days

$$N = 10(2)^3 \\ = 80$$

b) After how many days will 40960 people be infected?

$$40960 = 10(2)^t \\ 4096 = 2^t \\ \log 4096 = \log 2^t \\ \log 4096 = t \log(2) \\ t = \frac{\log 4096}{\log 2} \\ t = 12 \text{ days}$$

4) Rewrite each equation in logarithmic form

a) $4^3 = 64$

$$\log_4 64 = 3$$

b) $128 = 2^7$

$$\log_2 128 = 7$$

c) $5^{-2} = \frac{1}{25}$

$$\log_5 \left(\frac{1}{25}\right) = -2$$

d) $\left(\frac{1}{2}\right)^2 = 0.25$

$$\log_{\frac{1}{2}} 0.25 = 2$$

e) $6^x = y$

$$\log_6 y = x$$

f) $10^5 = 100\,000$

$$\log_{10} 100\,000 = 5$$

g) $\frac{1}{27} = 3^{-3}$

$$\log_3 \left(\frac{1}{27}\right) = -3$$

5) Evaluate each logarithm

a) $\log_2 64$

$$= \log_2(2^6)$$
$$= 6$$

b) $\log_3 27$

$$= \log_3(3^3)$$
$$= 3$$

c) $\log_2 \left(\frac{1}{4}\right)$

$$= \log_2(2^{-2})$$
$$= -2$$

d) $\log_4 \left(\frac{1}{64}\right)$

$$= \log_4(4^{-3})$$
$$= -3$$

e) $\log_5 125$

$$= \log_5(5^3)$$
$$= 3$$

f) $\log_2 1024$

$$= \log_2(2^{10})$$
$$= 10$$

6) Evaluate each common logarithm

a) $\log 1000$

$$= \log(10^3)$$
$$= 3$$

b) $\log \left(\frac{1}{10}\right)$

$$= \log(10^{-1})$$
$$= -1$$

c) $\log 1$

$$= \log(10^0)$$
$$= 0$$

d) $\log 0.001$

$$= \log(10^{-3})$$
$$= -3$$

e) $\log 10^{-4}$

$$= -4$$

f) $\log 1\,000\,000$

$$= \log(10^6)$$
$$= 6$$

7) Rewrite in exponential form

a) $\log_7 49 = 2$

$$7^2 = 49$$

b) $5 = \log_2 32$

$$2^5 = 32$$

c) $\log 10\,000 = 4$

$$10^4 = 10\,000$$

d) $w = \log_b z$

$$b^w = z$$

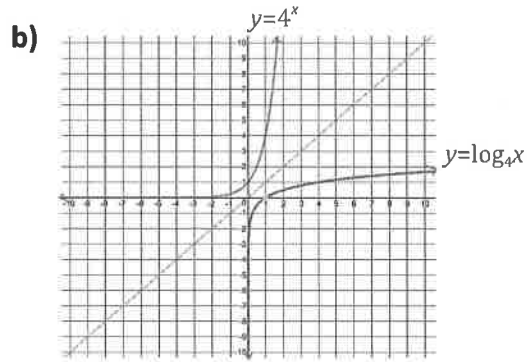
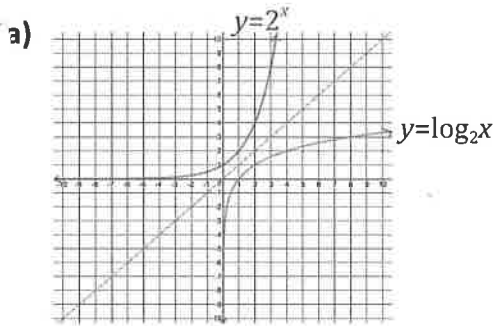
e) $\log_2 8 = 3$

$$2^3 = 8$$

f) $-2 = \log \left(\frac{1}{100}\right)$

$$10^{-2} = \frac{1}{100}$$

ANSWER KEY



2) C A B D

3)a) i) 10 ii) 20 iii) 40 iv) 80 b) 12 days

4)a) $\log_4 64 = 3$ b) $\log_2 128 = 7$ c) $\log_5 \left(\frac{1}{25}\right) = -2$ d) $\log_{\frac{1}{2}} 0.25 = 2$ e) $\log_6 y = x$

f) $\log_{10} 100\,000 = 5$ g) $\log_3 \left(\frac{1}{27}\right) = -3$

5)a) 6 b) 3 c) -2 d) -3 e) 3 f) 10

6)a) 3 b) -1 c) 0 d) -3 e) -4 f) 6

a) $7^2 = 49$ b) $2^5 = 32$ c) $10^4 = 10\,000$ d) $b^w = z$ e) $2^3 = 8$ f) $10^{-2} = \frac{1}{100}$