

12.3
p. 829

a logarithm is an exponent

$$p. 823 \rightarrow y = \log_a x \leftrightarrow x = a^y$$

logarithmic form exponential form

ex 6 $3^6 = 729 \rightarrow \log_3 729 = 6$

exponential form logarithmic form

May 2-6:27 PM

ex 8 $\left(\frac{1}{6}\right)^{-3} = 216 \rightarrow \log_{\frac{1}{6}} 216 = -3$

exp form log form

ex 10 $36^{\frac{1}{2}} = 6 \rightarrow \log_{36} 6 = \frac{1}{2}$

ex 12 $\sqrt[3]{343} = 7$

$343^{\frac{1}{3}} = 7 \rightarrow \log_{343} 7 = \frac{1}{3}$

May 2-6:39 PM

ex 18

$$\log_a 512 = 9 \qquad 2^9 = 512$$

log form \longrightarrow exp form

ex 20

$$\log_{100} 100 = 1 \longrightarrow 100^1 = 100$$

$$\log_5 5 = 1 \qquad 5^1 = 5$$

$$\boxed{\log_a a = 1 \iff a^1 = a} \leftarrow \text{p. 826}$$

May 2-6:44 PM

ex 22 $\log_a 1 = 0 \longrightarrow a^0 = 1$

p. 826 $\rightarrow \boxed{\log_a 1 = 0 \iff a^0 = 1}$

ex 24 $\log_{64} 2 = \frac{1}{6} \longrightarrow 64^{\frac{1}{6}} = 2$

p. 826

$$\boxed{\log_b b^r = r \longrightarrow b^r = b^r}$$

$$\boxed{b^{\log_b r} = r \longrightarrow \log_b r = \log_b r}$$

$$\begin{aligned} \log_{10} 1.96 &= \log y \\ 1.96 &= y \end{aligned}$$

May 2-6:47 PM

ex44

$$x = \log_{125} 5$$

$$125^x = 5$$

$$(5^3)^x = 5^1$$

$$5^{3x} = 5^1$$

$$3x = 1$$

$$x = \frac{1}{3}$$

ex46

$$\log_x 5 = \frac{1}{2}$$

$$x^{\frac{1}{2}} = 5$$

$$\sqrt{x}^2 = 5^2$$

$$x = 25$$

May 2-6:56 PM

ex 48

$$\log_x 64 = -6$$

$$x^{-6} = 64$$

$$x^6 \cdot \frac{1}{x^6} = 64 \cdot x^6$$

$$1 = 64x^6$$

$$\sqrt[6]{\frac{1}{64}} = \sqrt[6]{x^6}$$

$$\frac{1}{2} = x$$

ex50

$$\log_4 x = 0$$

$$4^0 = x$$

$$1 = x$$

May 2-7:00 PM

$$\underline{\text{ex 54}} \quad \log_x \frac{1}{10} = -1 \quad \underline{\text{ex 56}}$$

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

$$\frac{1}{x} = \frac{1}{10}$$

$$x = 10$$

$$\log_{81} 27 = x$$

$$81^x = 27$$

$$(3^4)^x = 3^3$$

$$3^{4x} = 3^3$$

$$4x = 3$$

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

May 2-7:07 PM

ex 64

$$\log_8 8 = x$$

$$8^x = 8^1$$

$$x = 1$$

ex 66

$$\log_{12} 1 = y$$

$$12^y = 1$$

$$12^y = 12^0$$

$$y = 0$$

May 2-7:11 PM

ex 68 $\log_5 5^6 = x$
 $5^x = 5^6$
 $x = 6$

ex 70
 $\log_4 4^{-6} = x$
 $4^x = 4^{-6}$
 $x = -6$

May 2-7:14 PM

ex 72
 ~~\log_{12}~~ $3 = x$

$$\log_{12} x = \log_{12} 3$$

$$x = 3$$

ex 74
 $5^{\log_5 11} = x$

$$\log_5 x = \log_5 11$$

$$x = 11$$

May 2-7:16 PM

ex 76

$$\log_2 128 = x$$

$$2^x = 128$$

$$2^x = 2^7$$

$$x = 7$$

$$\log_2 128$$

$$\log_2 2^7$$

7

May 2-7:20 PM

ex 78

$$\log_3 27 = x$$

$$3^x = 27$$

$$3^x = 3^3$$

$$x = 3$$

$$\log_3 27$$

$$\log_3 3^3$$

3

May 2-7:22 PM

ex 82

$$\log_a \sqrt[3]{9} = x$$

$$9^x = \sqrt[3]{9}$$

$$9^x = 9^{\frac{1}{3}}$$

$$x = \frac{1}{3}$$

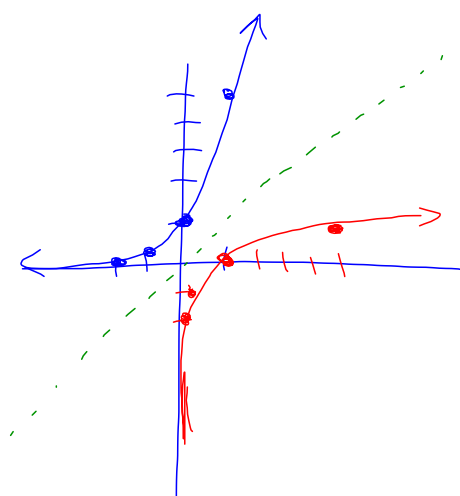
May 2-7:23 PM

ex 84

$$g(x) = \log_5 x$$

$$g^{-1}(x) = 5^x$$

x	y
$\frac{1}{25}$	-2
$\frac{1}{5}$	-1
1	0
5	1
25	2



x	y
-2	$\frac{1}{25}$
-1	$\frac{1}{5}$
0	1
1	5
2	25

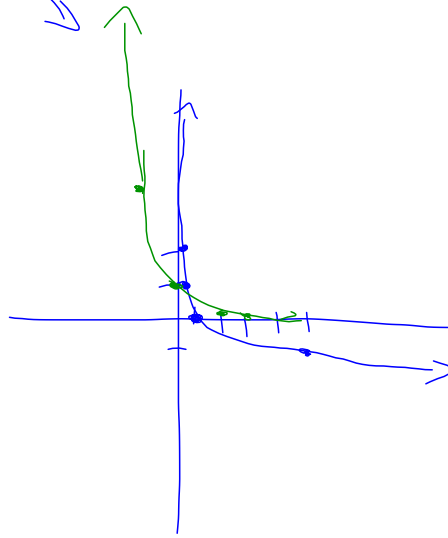
May 2-7:25 PM

ex 86

$$f(x) = \log_{\frac{1}{5}} x$$

$$f^{-1}(x) = \left(\frac{1}{5}\right)^x$$

x	y
25	-2
5	-1
1	0
$\frac{1}{5}$	1
$\frac{1}{25}$	2



x	y
-2	25
-1	5
0	1
1	$\frac{1}{5}$
2	$\frac{1}{25}$

May 2-7:33 PM

ex 96 $M(t) = 6 \log_4(2t + 4)$

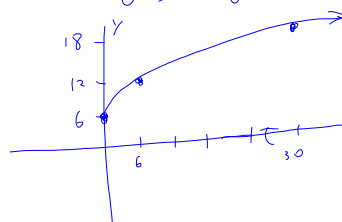
a) $t=0$ Jan '14 $M(0) = 6 \log_4(2 \cdot 0 + 4)$
 $= 6 \log_4 4$
 $= 6 \cdot 1 = 6$

b) July '14 $t=6$ $M(6) = 6 \log_4(2 \cdot 6 + 4)$
 $= 6 \log_4 16$
 $= 6 \cdot 2 = 12$

c) July '16 $t=30$ $M(30) = 6 \log_4(2 \cdot 30 + 4)$
 $= 6 \log_4 64$
 $= 6 \cdot 3 = 18$

d) $y = M(t)$

t	y
0	6
6	12
30	18



May 2-7:37 PM