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SOLUTIONS TO
ASSIGNMENT # 8
201-009-50
LOGARITHMS

P. 133 # 59, 60, 66, 70*, 72* * Also GRAPH inverses
P. 144 # 97, 100, 103
P. 145 # 118, # 122

59 $\ln\left(\frac{x+1}{2x+3}\right) = 0$

$$e^{\ln\left(\frac{x+1}{2x+3}\right)} = e^0$$

$$\frac{x+1}{2x+3} = 1$$

$$x+1 = 2x+3$$

$$\boxed{-2 = x}$$

60 $\log_3(x^2-13) = 1$

$$3^{\log_3(x^2-13)} = 3^1$$

$$x^2 - 13 = 3$$

$$x^2 = 16$$

$$\boxed{x = \pm 4}$$

66 $\log_2(\log_2 x) = 2$

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

$$\log_2 x = 4$$

$$2^{\log_2 x} = 2^4$$

$$\boxed{x = 16}$$

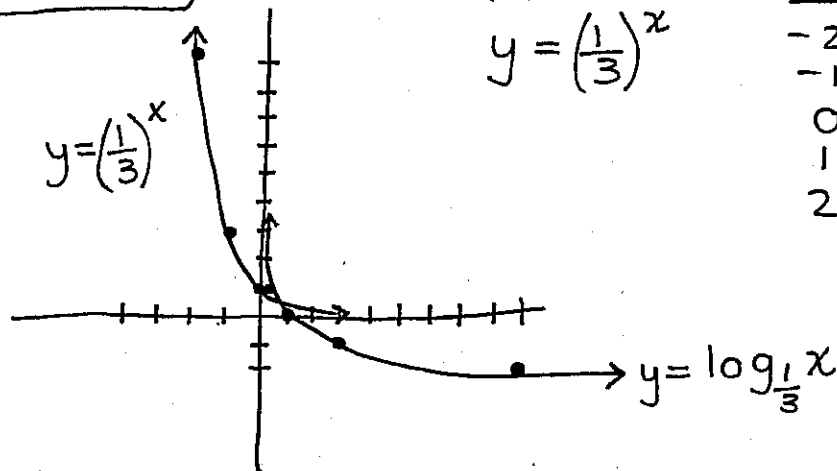
70 $y = \log_{1/3} x$

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

y	x
-2	9
-1	3
0	1
1	1/3
2	1/9

Inverse
 $y = \left(\frac{1}{3}\right)^x$

x	y
-2	9
-1	3
0	1
1	1/3
2	1/9



72 $y = \log_{1/4} x + 1$

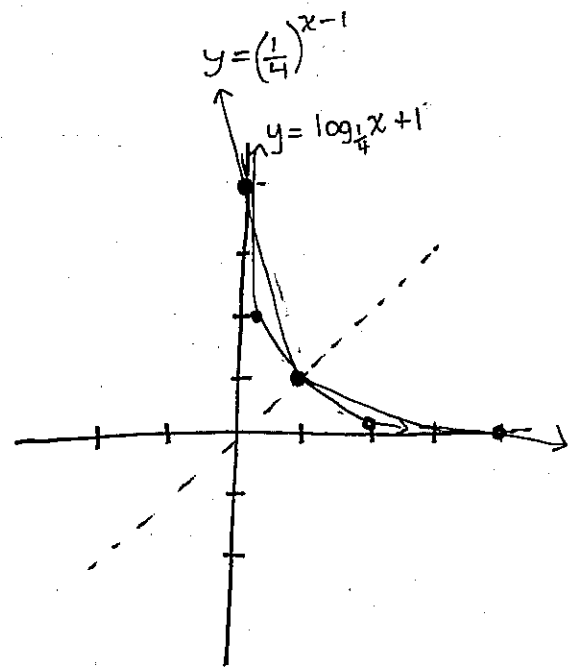
$$y - 1 = \log_{1/4} x$$

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

y	x
-1	16
0	4
1	1
2	1/4

inverse
 $y = \left(\frac{1}{4}\right)^{x-1}$

y	x
16	-1
4	0
1	1
1/4	2



97 $2^{4/x} = 3$
 $\ln 2^{4/x} = \ln 3$
 $\frac{4}{x} \ln 2 = \ln 3$

$$\frac{4 \ln 2}{\ln 3} = x$$

$$x = 2.52$$

100

$$5 + e^{x-3} = 27$$

$$e^{x-3} = 22$$

$$\ln e^{x-3} = \ln 22$$

$$x - 3 = \ln 22$$

$$x = \ln 22 + 3$$

$$x = 6.09$$

103 $4^{2x-1} = 7^{x+2}$

$$\ln 4^{2x-1} = \ln 7^{x+2}$$

$$(2x-1) \ln 4 = (x+2) \ln 7$$

$$2x \ln 4 - \ln 4 = \ln 7 x + 2 \ln 7$$

$$2 \ln 4 x - \ln 7 x = 2 \ln 7 + \ln 4$$

$$x (2 \ln 4 - \ln 7) = 2 \ln 7 + \ln 4$$

$$x = \frac{2 \ln 7 + \ln 4}{2 \ln 4 - \ln 7}$$

$$= 6.38$$

(3)

$$\#118 \quad [\log_3(x-1)]^2 - 3\log_3(x-1) = 4$$

$$\text{Let } y = \log_3(x-1)$$

THEN THE EQUATION BECOMES

$$y^2 - 3y - 4 = 0$$

$$(y-4)(y+1) = 0$$

$$\text{so } y = 4 \quad y = -1$$

$$\text{BUT } y = \log_3(x-1)$$

$$4 = \log_3(x-1)$$

$$3^4 = x-1$$

$$x = 3^4 + 1$$

$$= 82$$

$$-1 = \log_3(x-1)$$

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

$$3^{-1} + 1 = x$$

$$x = 4/3$$

$$x = 4/3, 82$$

#122

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

$$3^x + \frac{1}{3^x} = 4$$

$$3^x 3^x + 1 = 4 \cdot 3^x$$

$$(3^x)^2 - 4(3^x) + 1 = 0$$

$$\text{Let } y = 3^x$$

$$y^2 - 4y + 1 = 0$$

$$y = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(1)}}{2(1)}$$

$$= 3.732, 0.2679$$

$$\text{BUT } y = 3^x$$

$$3.732 = 3^x$$

$$\ln 3.732 = x \ln 3$$

$$x = 1.2$$

$$0.2679 = 3^x$$

$$\ln 0.2679 = x \ln 3$$

$$x = -1.2$$

$$x = \pm 1.2$$