Answer Key 10

4.3: 4,7,15,17,24,29,33,36,43,56,59,75
4.4: 10,12,19,32,39,51,52,59
4.5: 3,10,11,21,30,35,41,47,49,54,61,64,85

4.3

4)
a) III (a standard log function)
b) II (reflection in *y*-axis)
c) I (reflection in *x*-axis
d) IV (reflection in both axes

7)

$\log_8 8 = 1$	$[8^1 = 8]$
$\log_8 64 = 2$	$[8^2 = 64]$
$[\log_8 4 = 2/3]$	$8^{2/3} = 4$
$[\log_8 512 = 3]$	$8^3 = 512$
$\log_8 (1/8) = -1$	$[8^{-1} = 1/8]$
$[\log_8 (1/64) = -2]$	$8^{-2} = 1/64$

15)
a) $e^{3y} = 5$
b) $e^{-1} = t + 1$

17)
a) $\log_{10} 10,000 = 4$
b) $\log_5 1/25 = -2$

24)
a) $\ln(.05) = x + 1$
b) $\ln t = .05x$

29)
a) -3
b) 1/2
c) -1

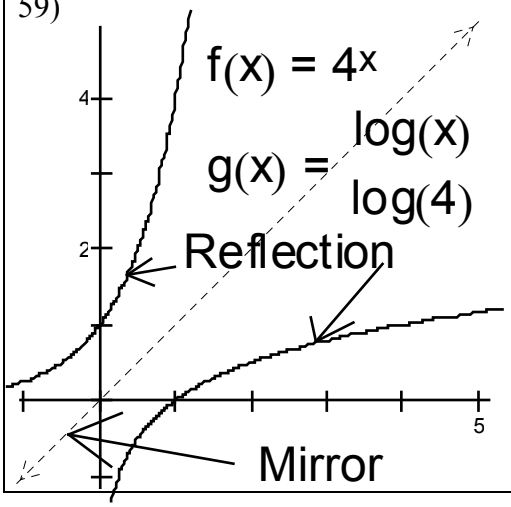
33)
a) -2/3
b) 4
c) -1

36)
a) 1/9
b) 3

43)
a) x=2
b) x=4

56)
$\log_x 9 = 2 \rightarrow x^2 = 9 \rightarrow x = 3$

59)



75)
$g(x) = \log_3(x^2 - 1)$
We know the domain of the log function is $x > 0$ so we have
$x^2 - 1 > 0$
$x^2 > 1$
$Domain = (-\infty, -1) \cup (1, \infty)$

4.4

10) $\log_6 9 + \log_6 24 = \log_6 \left(6^3\right) = 3$	12) $\log_3 135 - \log_3 45 = \log_3 \left(135/45\right) =$ $\log_3 3 = 1$
19) $\log_4 16^{100} = 100 \log_4 16 =$ $100 \cdot 2 = 200$	32) $\log_3 x\sqrt{y} = \log_3 + \log \sqrt{y} =$ $\log_3 + \log y^{1/2} = \log_3 + \frac{1}{2} \log y$
39) $\log\left(\frac{x^3 y^4}{z^6}\right) = 3\log x + 4\log y - 6\log z$	51) $2\log x - 3\log\left(x+1\right) =$ $\log x^2 - \log\left(x+1\right)^3 =$ $\log\left(\frac{x^2}{\left(x+1\right)^3}\right)$
52) $3\ln 2 + 2\ln x - \frac{1}{2}\ln\left(x+4\right) =$ $\ln 2^3 + \ln x^2 - \ln\sqrt{x+4} =$ $\ln\left(\frac{8x^2}{\sqrt{x+4}}\right)$	59) $\log_2 5 = \frac{\log_{10} 5}{\log_{10} 2} = 2.321928$

4.5

3) $5^{x-1} = 125$ $\log_5 5^{x-1} = \log_5 125$ $x - 1 = 3$ $x = 4$	10) $10^{2x^2-3} = 10^{9-x^2}$ $2x^2 - 3 = 9 - x^2$ $3x^2 - 12 = 0$ $x^2 - 4 = 0$ $x = \pm 2$
11) $10^x = 25$ $x = \log_{10} 25 \approx 1.397940$	21) $e^{1-4x} = 2$ $1 - 4x = \ln 2$ $4x = 1 - \ln 2$ $x = \frac{1-\ln 2}{4} \approx .076713$

30)

$1+e^{4x+1}=20$

$e^{4x+1}=19$

$4x+1=\ln 19$

$4x=\ln 19-1$

$x=\dfrac{\ln 19-1}{4}\approx .486110$

35) [Hard]

$2^{3x+1}=3^{x-2}$

$(3x+1)\ln 2=(x-2)\ln 3$

$x(3\ln 2-\ln 3)=-(\ln 2+2\ln 3)$

$x(\ln 8/3)=-\ln 18$

$x=-\dfrac{\ln 18}{\ln 8/3}\approx -2.946865$

41)

$e^{4x}+4e^{2x}-21=0$

$y=e^{2x}$

$y^2+4y-21=0$

$(y+7)(y-3)=0$

$e^{2x}=3$

$2x=\ln 3$

$x=\dfrac{\ln 3}{2}\approx .549306$

Note $e^{2x}\neq -7$

47)

$4x^3e^{-3x}-3x^4e^{-3x}=0$

$e^{-3x}(4x^3)(1-3x)=0$

$x=\{0,1/3\}$

Note $e^{-3x}\neq 0$

49)

$\log x+\log(x-1)=\log 4x$

$\log x+\log(x-1)=\log 4+\log x$

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

$x-1=4$

$x=5$

54)

$\log_4(x+1)+\log_4 3=\log_4 5+\log_4(2x-3)$

$\log_4 3(x+1)=\log_4 5(2x-3)$

$3(x+1)=5(2x-3)$

$3x+3=10x-15$

$7x=18$

$x=18/7$

61)

$4-\log(3-x)=3$

$\log(3-x)=1$

$3-x=10$

$x=-13$

64)

$\log x+\log(x-3)=1$

$\log x(x-3)=1$

$x(x-3)=10$

$x^2-3x-10=0$

$(x-5)(x+2)=0$

$x=5$

Note log(-2) is undefined

85)

$f(x)=\log_2(x-1)$

$y=\log_2(x-1)$

$x=\log_2(y-1)$

85) continued

$2^x=y-1$

$y=2^x+1$

$f^{-1}(x)=2^2+1$