

Homework #2B

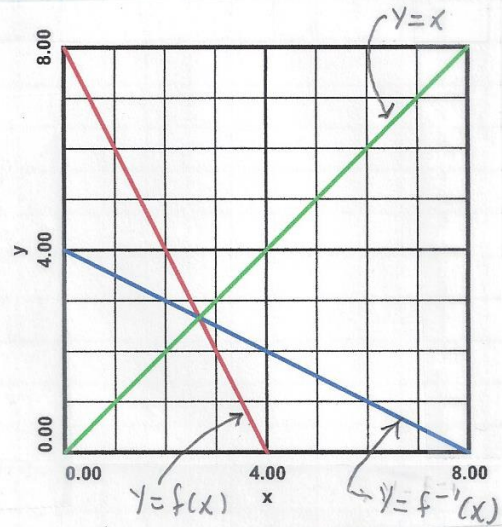
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Lesson 2B.1:

1)

$$\begin{aligned} a) \quad y &= f(x) = -2x + 8, \quad x = -2y + 8, \\ -2y &= x - 8, \quad y = -\frac{1}{2}(x - 8), \\ y &= f^{-1}(x) = -\frac{1}{2}x + 4 \end{aligned}$$

b)



$$2) \quad f(f^{-1}(x)) = f(f^{-1}) = -2f^{-1} + 8 =$$

$$a) \quad = -2\left(-\frac{1}{2}x + 4\right) + 8 = x - 8 + 8 = x$$

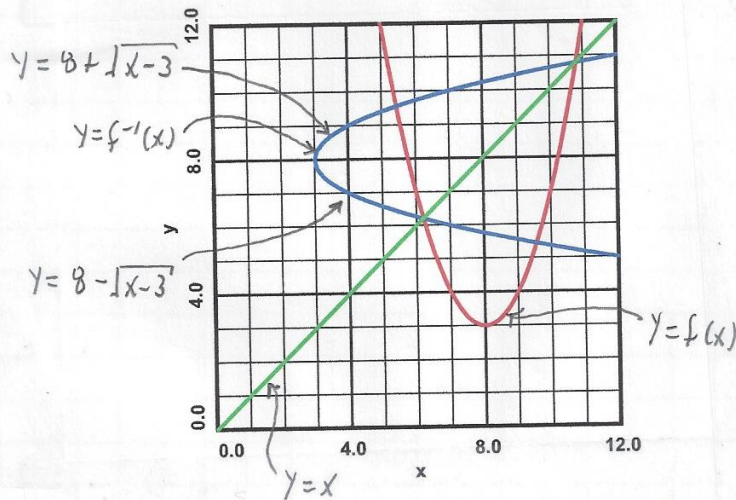
$$b) \quad f^{-1}(f(x)) = f^{-1}(f) = -\frac{1}{2}f + 4 =$$

$$= -\frac{1}{2}(-2x + 8) + 4 = x - 4 + 4 = x$$

Lesson 2B.2:

$$\begin{aligned} 3) \quad a) \quad y &= f(x) = x^2 - 16x + 67, \quad y - 67 = x^2 - 16x, \quad y - 3 = x^2 - 16x + 64, \\ y - 3 &= (x - 8)^2, \quad y = f(x) = (x - 8)^2 + 3, \quad x = (y - 8)^2 + 3, \quad (y - 8)^2 = x - 3, \\ y - 8 &= \pm \sqrt{x - 3}, \quad y = f^{-1}(x) = 8 \pm \sqrt{x - 3} \end{aligned}$$

b)



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$$4) f(f^{-1}(x)) = f(f^{-1}) = (f^{-1})^2 - 16f^{-1} + 67$$

$$(f^{-1})^2 = (8 \pm \sqrt{x-3})^2 = 64 \pm 16\sqrt{x-3} + x-3 = x+61 \pm 16\sqrt{x-3}$$

$$f(f^{-1}) = x+61 \pm 16\sqrt{x-3} - 16(8 \pm \sqrt{x-3}) + 67 =$$

$$= x+61 \pm 16\sqrt{x-3} - 128 \mp 16\sqrt{x-3} + 67 =$$

$$= x+61-128+67 = x$$

Lesson 28.3:

$$5) y = f(x) = \frac{5x-9}{13x-17}, \quad x = \frac{5y-9}{13y-17}, \quad x(13y-17) = 5y-9,$$

$$13xy - 17x = 5y - 9, \quad 13xy - 5y = 17x - 9, \quad y(13x-5) = 17x-9$$

$$y = f^{-1}(x) = \frac{17x-9}{13x-5}$$

$$6) a) f(f^{-1}(x)) = f(f^{-1}) = \frac{5f^{-1}-9}{13f^{-1}-17} = \frac{5\left(\frac{17x-9}{13x-5}\right) - 9\left(\frac{13x-5}{13x-5}\right)}{13\left(\frac{17x-9}{13x-5}\right) - 17\left(\frac{13x-5}{13x-5}\right)} =$$

$$= \frac{5(17x-9) - 9(13x-5)}{13(17x-9) - 17(13x-5)} = \frac{85x-45-117x+45}{221x-117-221x+85} = \frac{-32x}{-32} = x$$

$$b) f^{-1}(f(x)) = f^{-1}(f) = \frac{17f-9}{13f-5} = \frac{17\left(\frac{5x-9}{13x-17}\right) - 9\left(\frac{13x-17}{13x-17}\right)}{13\left(\frac{5x-9}{13x-17}\right) - 5\left(\frac{13x-17}{13x-17}\right)} =$$

$$= \frac{17(5x-9) - 9(13x-17)}{13(5x-9) - 5(13x-17)} = \frac{85x-153-117x+153}{65x-117-65x+85} = \frac{-32x}{-32} = x$$

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Lesson 2B.4:

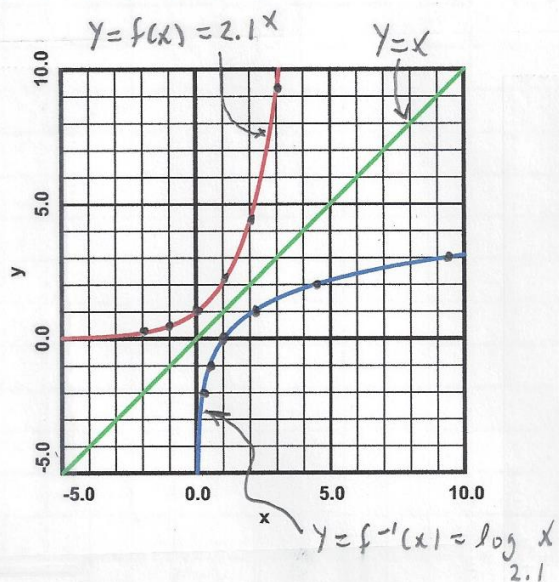
7) a)

x	$y = f(x) = 2.1^x$
-2	0.227
-1	0.467
0	1.000
1	2.100
2	4.410
3	9.261

6)

x	$y = f^{-1}(x) = \log_{2.1} x$
0.227	-2
0.467	-1
1.000	0
2.100	1
4.410	2
9.261	3

c)



8) a)

$$\log_4 4^x = \log_4 1024$$

$$x = \log_4 1024 \leftarrow$$

b) $\log_6 6^x = \log_6 1296$

$$x = \log_6 1296 \leftarrow$$

9) a)

$$5^x = 5^{\log_5 3125}$$

$$5^x = 3125 \leftarrow$$

b) $3^x = 3^{\log_3 2187}$

$$3^x = 2187 \leftarrow$$

10) a) $5^{\log_5 x} = 5^3$, $x = 5^3 = 125 \leftarrow$ b) $x^{\log_x 49} = x^2$, $x^2 = 49$, $x = 7 \leftarrow$

Lesson 2B.5

11) a) $5^x = 5^{\log_5 125}$, $5^x = 125$, $x = \log_5 125 = 3 \leftarrow$

b) $2^x = 2^{\log_2 32}$, $2^x = 32$, $x = \log_2 32 = 5 \leftarrow$

12) a) $\log_7 2000 = 3.9061 \leftarrow$ b) $\log_4 1000 = 4.9829 \leftarrow$

13) a) $\ln 1100 = 7.0031 \leftarrow$ b) $\log_{10} 500 = 4.0212 \leftarrow$

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14) a) $\log_{17} 17^x = \log_{17} 70$, $x = \log_{17} 70 = 1.4995 \leftarrow$

b) $\log_{13} 13^{5x-9} = \log_{13} 2200$, $5x-9 = \log_{13} 2200$, $5x = 9 + \log_{13} 2200$,
 $x = \frac{1}{5} [9 + \log_{13} 2200] = 2.4001 \leftarrow$

15) a) $7^{\log_7 (3x+11)} = 7^4$, $3x+11 = 7^4 = 2401$, $3x = 2390$, $x = 796 \frac{2}{3} \leftarrow$

b) $10^{\log (5x-4)} = 10^3$, $5x-4 = 1000$, $5x = 1004$, $x = 200 \frac{4}{5} \leftarrow$

c) $e^{\ln(4x-5)} = e^8$, $4x-5 = e^8$, $4x = e^8 + 5$, $x = \frac{1}{4} [e^8 + 5] =$
 $= 246.4895 \leftarrow$

Lesson 2B.6

16) $4^{2x} \cdot 5^{3x} = (4^2)^x \cdot (5^3)^x = 16^x \cdot 125^x = (16 \cdot 125)^x = 2000^x = 400$,

$\log_{2000} 2000^x = \log_{2000} 400$, $x = \log_{2000} 400 = 0.7883 \leftarrow$

17) $3^x \cdot 3^x + 3^x \cdot 3^{-x} = 4 \cdot 3^x$ ($3^x \cdot 3^{-x} = 3^{x-x} = 3^0 = 1$)

$(3^x)^2 + 1 = 4(3^x)$, $(3^x)^2 - 4(3^x) + 1 = 0$. Let $z = 3^x$ (or $x = \log_3 z$)
 $\Rightarrow z^2 - 4z + 1 = 0$, $z = \frac{4 \pm \sqrt{(-4)^2 - 4(1)(1)}}{2(1)} = \frac{4 \pm \sqrt{12}}{2} = \frac{4 \pm \sqrt{4} \sqrt{3}}{2} =$

$= \frac{4 \pm 2\sqrt{3}}{2} = 2 \pm \sqrt{3}$, $x = \log_3 (2 - \sqrt{3}) = -1.1987 \leftarrow$

$x = \log_3 (2 + \sqrt{3}) = 1.1987 \leftarrow$

18) a) $y = f(x) = 7^{4x-3} + 8$, $x = 7^{4y-3} + 8$, $7^{4y-3} = x - 8$,

$\log_7 7^{4y-3} = \log_7 (x-8)$, $4y-3 = \log_7 (x-8)$, $4y = 3 + \log_7 (x-8)$

$y = f^{-1}(x) = \frac{1}{4} [3 + \log_7 (x-8)] \leftarrow$

b) $y = f(x) = \log_{13} (2x+5) - 17$, $x = \log_{13} (2y+5) - 17$,

$\log_{13} (2y+5) = x+17$, $13^{\log_{13} (2y+5)} = 13^{x+17}$, $2y+5 = 13^{x+17}$,

$2y = 13^{x+17} - 5$, $y = f^{-1}(x) = \frac{1}{2} [13^{x+17} - 5] \leftarrow$