Sec 1.5 Inverse Functions pg 127 #5-45(5), 69-73, 81-85 odd

For 5, 10 $f(f^{-1}(x)) = x$ and $f^{-1}(f(x)) = x$.

#5) $f(x) = 8x$

$f^{-1}(x) = \frac{x}{8}$

$f\left(\frac{x}{8}\right) = 8\left(\frac{x}{8}\right) = x$ ✓

$f^{-1}(8x) = \frac{8x}{8} = x$ ✓

#10) $f(x) = \frac{x-1}{4}$

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

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

$= \frac{4x+1-1}{4} = \frac{4x}{4} = x$ ✓

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

$= x-1+1$

$= x$ ✓

#15) $f(x) = 5x+1$, $g(x) = \frac{x-1}{5} = \frac{x}{5} - \frac{1}{5}$

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

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

$= x-1+1$

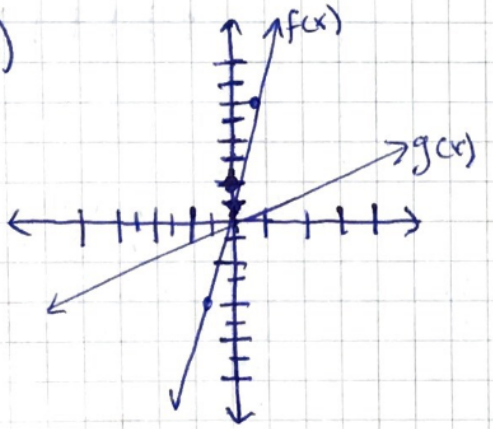
$= x$ ✓

$g(f(x)) = g(5x+1)$

$= \frac{5x+1-1}{5}$

$= x$ ✓

b)



Reflection in the line $y = x$

#20) $f(x) = 9 - x^2$, $x \geq 0$; $g(x) = \sqrt{9-x}$

a) $f(g(x)) = f(\sqrt{9-x}) = 9 - (\sqrt{9-x})^2$

$= 9 - 9 + x$

$= x$ ✓

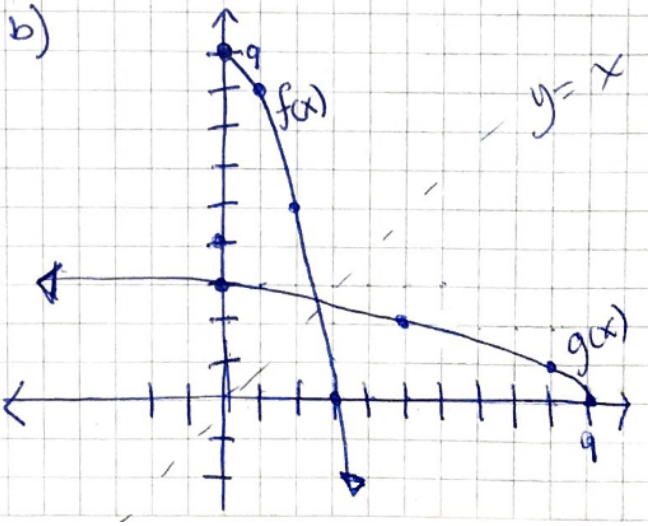
$g(f(x)) = g(9-x^2) = \sqrt{9-(9-x^2)}$

$= \sqrt{9-9+x^2}$

$= \sqrt{x^2}$

$= x$ ✓

b)



Sec 1.5 Cont.

#25) $f(x) = x^3 + 5$, $g(x) = \sqrt[3]{x-5}$

a) $f(g(x)) = f(\sqrt[3]{x-5})$

$= (\sqrt[3]{x-5})^3 + 5$

$= x - 5 + 5$

$= x$ ✓

$g(f(x)) = g(x^3+5)$

$= \sqrt[3]{(x^3+5)-5}$

$= \sqrt[3]{x^3+5-5}$

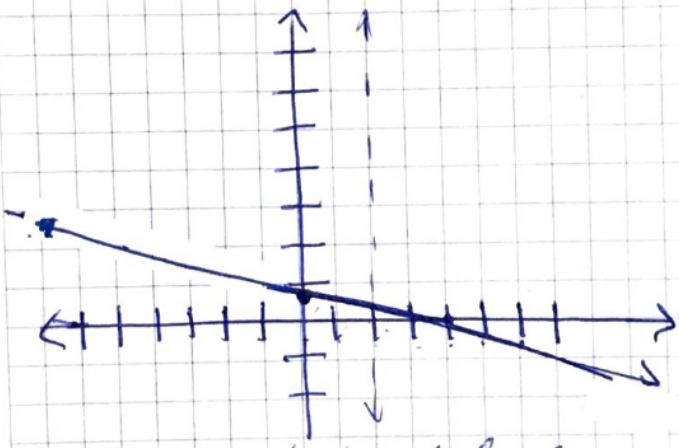
$= x$ ✓

b)

x	f(x)
-3	-22
-2	-3
-1	4
0	5
1	6

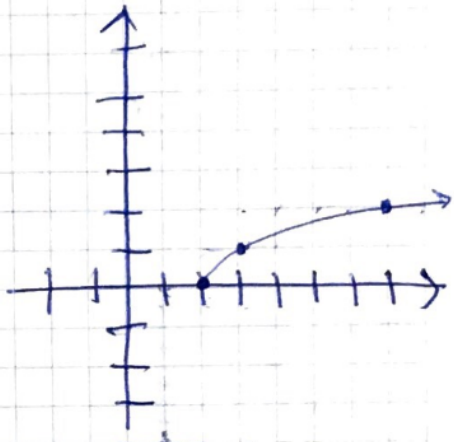
x	g(x)
-22	-3
-3	-2
4	-1
5	0
6	1

#30) $g(x) = \frac{4-x}{6} \Rightarrow \frac{2}{3} - \frac{1}{6}x$



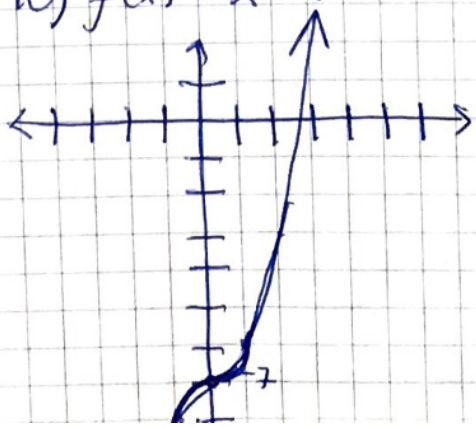
Since no horizontal line crosses the graph of $f(x)$ at more than one point. $f(x)$ has an inverse

#35) $f(x) = \sqrt{x-2}$

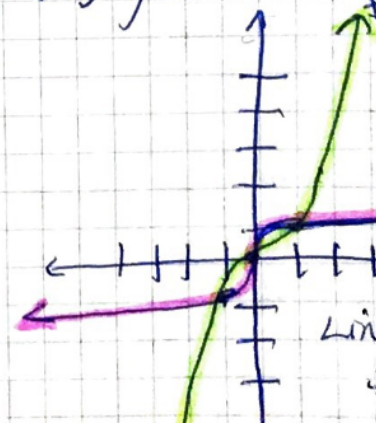


yes, $\sqrt{x-2}$ has an inverse, b/c no horizontal line intersects the graph at more than one point.

#40) $f(x) = x^5 - 7$



#45) $f(x) = x^5$



$f(x) = x^5$

$y = x^5$

$\sqrt[5]{x} = \sqrt[5]{y^5}$

$g(x)$ $\sqrt[5]{x} = y$

$f^{-1}(x) = \sqrt[5]{x}$

Line of reflection is $y = x$.

Sec 1.5 Cont 69-73 odd, 81-85 odd

#69) $f(x) = (x-2)^2$, $x \geq 2$

$y = (x-2)^2$

$x = (y-2)^2$

$\sqrt{x} = y - 2$

$\sqrt{x} + 2 = y$

$f^{-1}(x) = \sqrt{x} + 2$, $x \geq 0$

#71 $f(x) = |x+2|$, $x \geq -2$

$y = x + 2$ when $x \geq -2, y \geq$

$x = y + 2$ ← switch $x \geq 0, y \geq -2$

$x - 2 = y$

$f^{-1}(x) = x - 2$, $x \geq 0$

#73)

Point's From graph

x	f(x)
-2	-4
-1	-2
1	2
3	3

x	$f^{-1}(x)$
-4	-2
-2	-1
2	1
3	3

$f(x) = \frac{1}{8}x - 3$, $g(x) = x^3$

#81) $(f^{-1} \circ f^{-1})(6)$

$f^{-1}(f^{-1}(6))$

$f^{-1}(8(6+3))$ = 9

$f^{-1}(72) = 8(72+3)$ = 75

$= \boxed{600}$

$f^{-1}(x) = 8(x+3)$

$g^{-1}(x) = \sqrt[3]{x}$

#83) $(f \circ g)^{-1}$

$= f^{-1}(g^{-1})$

$y = \frac{1}{8}x^3 - 3$

$x = \frac{1}{8}y^3 - 3$

$x + 3 = \frac{1}{8}y^3$

$\sqrt[3]{8(x+3)} = \sqrt[3]{y^3}$

$\sqrt[3]{8(x+3)} = y$

$2\sqrt[3]{x+3} = y$

$\boxed{(f \circ g)^{-1}(x) = 2\sqrt[3]{x+3}}$

$f(g(x)) = f(x^3)$

$= \frac{1}{8}(x^3) - 3$

$= \frac{1}{8}x^3 - 3$

#85) $g^{-1} \circ f^{-1}$

$g^{-1}(f^{-1}(x))$

$g^{-1}(x-4)$

$= \frac{(x-4)+5}{2}$

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

$f(x) = x + 4$, $g(x) = 2x - 5$

$f^{-1}(x) = x - 4$, $g^{-1}(x) = \frac{x+5}{2}$

NOTE BOOK