College Algebra CHS Name Key

Function Inverses

Date

State if the given functions are inverses.

1) $f(x) = x + 2$, $g(x) = \frac{x-5}{8}$

$(fog)(x) = \left(\frac{x-5}{8}\right) + 2 = \frac{x-5+16}{8} = \frac{x-11}{8}$

$(gof)(x) = \frac{(x+2)-5}{8} = \frac{x-3}{8}$

No

2) $g(x) = 3x$, $f(x) = \frac{1}{3}x$

$(fog)(x) = \frac{1}{3}(3x) = x$

$(gof)(x) = 3\left(\frac{1}{3}x\right) = x$

yes

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

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

$= -(x + 5\sqrt[5]{x^4} + 10\sqrt[5]{x^3} + 10\sqrt[5]{x^2} + 5\sqrt[5]{x} + 1) - 1$

$= -x - 5\sqrt[5]{x^4} - 10\sqrt[5]{x^3} - 10\sqrt[5]{x^2} - 5\sqrt[5]{x} - 4 - 1$

not x

No

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

4) $h(n) = \frac{-4 + \sqrt[3]{4n}}{2}$, $g(n) = \frac{n^3 + 1}{2}$

$h(x) = \sqrt[3]{-x+1}$, $f(x) = -x^3 + 1$

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

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

yes

5) $f(n) = \frac{3}{n+3} - 1$, $g(n) = \frac{3}{n-2} - 2$

$f(x) = \frac{4}{-x+3}$, $g(x) = \frac{-4}{x} + 3$

yes

$(fog)(x) = \frac{4}{-\left(\frac{-4}{x}+3\right)+3} = \frac{4}{\frac{4}{x}-3+3} = \frac{4}{\frac{4}{x}} = 4 \div \frac{4}{x} = \frac{4}{1} \cdot \frac{x}{4} = x$

$(gof)(x) = \frac{-4}{\left(\frac{4}{-x+3}\right)} + 3 = -4 \div \frac{4}{-x+3} + 3 = -4 \cdot \frac{-x+3}{4} + 3 = -1(-x+3) + 3 = x - 3 + 3 = x$

No

6) $h(x) = \frac{2}{x-1} - 2$, $f(x) = -\frac{4}{x+1} + 3$

$(hof)(x) = \frac{2}{\left(-\frac{4}{x+1}+3\right)-1} - 2 = \frac{2}{-\frac{4}{x+1}+2} - 2 = \frac{2}{\frac{-4+2(x+1)}{x+1}} - 2 = 2 \cdot \frac{x+1}{-4+2x+2} - 2 = \frac{2x+2}{2x-2} - 2$

$= \frac{2(x+1)}{2(x-1)} - \frac{2(x-1)}{(x-1)} = \frac{x+1-2x+2}{x-1} = \frac{-x+3}{x-1}$

As soon as I see this isn't x, no

Find the inverse of each function.

7) $g(x) = \frac{-x-4}{4}$

$x = \frac{-y-4}{4}$

$4x = -y - 4$

$4x + 4 = -y$

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

8) $g(x) = -2x - 4$

$x = -2y - 4$

$x + 4 = -2y$

$g^{-1}(x) = -\frac{1}{2}x - 2$

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

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

$y = x^5$

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

10) $g(x) = \frac{4 + \sqrt[3]{4x}}{2}$

$x = \frac{4 + \sqrt[3]{4y}}{2}$

$2x = 4 + \sqrt[3]{4y}$

$2x - 4 = \sqrt[3]{4y}$

$4y = (2x-4)^3$

$y = \frac{(2x-4)^3}{4}$

$g^{-1}(x) = \frac{(2x-4)^3}{4}$

11) $g(x) = \frac{3}{x-1} + 2$

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

$\frac{x-2}{1} = \frac{3}{y-1}$

$(y-1)(x-2) = 3$

$y - 1 = \frac{3}{x-2}$

$g^{-1}(x) = \frac{3}{x-2} + 1$

12) $f(x) = \frac{1}{x-1} - 2$

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

$x+2 = \frac{1}{y-1}$

$(y-1)(x+2) = 1$

$y - 1 = \frac{1}{x+2}$

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

13) $g(x) = 2(x-3)^3$

$x = 2(y-3)^3$

$\frac{x}{2} = (y-3)^3$

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

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

$\frac{\sqrt[3]{4x}}{2} + 3 = y$

$g^{-1}(x) = \frac{\sqrt[3]{4x} + 6}{2}$ or $\frac{\sqrt[3]{4x}}{2} + 3$

14) $h(x) = \frac{-5x + 15}{7}$

$x = \frac{-5y + 15}{7}$

$7x = -5y + 15$

$7x - 15 = -5y$

$h^{-1}(x) = -\frac{7}{5}x + 3$

15) $h(n) = \sqrt[3]{n+1} - 2$

$x = \sqrt[3]{y+1} - 2$

$x + 2 = \sqrt[3]{y+1}$

$(x+2)^3 = y + 1$

$h^{-1}(n) = (n+2)^3 - 1$

16) $f(x) = \sqrt[3]{x+3}$

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

$x^3 = y + 3$

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

17) $g(x) = 2x^3 - 2$

$x = 2y^3 - 2$

$x + 2 = 2y^3$

$\frac{x+2}{2} = y^3$

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

18) $h(x) = 2(x-2)^5$

$\frac{x}{2} = (y-2)^5$

$\sqrt[5]{\frac{x}{2}} = y - 2$

$h^{-1}(x) = \sqrt[5]{\frac{x}{2}} + 2$

19) $f(n) = -2(n+3)^3$

$\frac{x}{-2} = (y+3)^3$

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

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

$f^{-1}(n) = \sqrt[3]{\frac{n}{-2}} - 3$

20) $f(x) = \frac{4}{x+2}$

$x = \frac{4}{y+2}$

$(y+2)x = 4$

$y + 2 = \frac{4}{x}$

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

21) $f(x) = \sqrt[3]{-\frac{x}{2}}$

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

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

$x^3 = -\frac{y}{2}$

$2x^3 = -y$

22) $f(x) = -7x - 4$

$x = -7y - 4$

$x + 4 = -7y$

$f^{-1}(x) = -\frac{x}{7} - \frac{4}{7}$

23) $f(n) = \sqrt[5]{n-1} - 2$

$x = \sqrt[5]{y-1} - 2$

$x + 2 = \sqrt[5]{y-1}$

$(x+2)^5 = y - 1$

$f^{-1}(n) = (n+2)^5 + 1$

24) $g(x) = (x-2)^3 - 2$

$x = (y-2)^3 - 2$

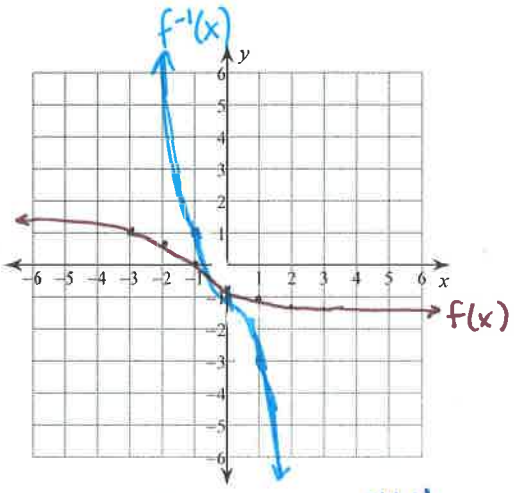
$x + 2 = (y-2)^3$

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

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

Find the inverse of each function. Then graph the function and its inverse.

25) $f(x) = \sqrt[3]{\frac{-x-1}{2}}$



$x = \sqrt[3]{\frac{-y-1}{2}}$

$x^3 = \frac{-y-1}{2}$

$2x^3 = -y - 1$

$2x^3 + 1 = -y$

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

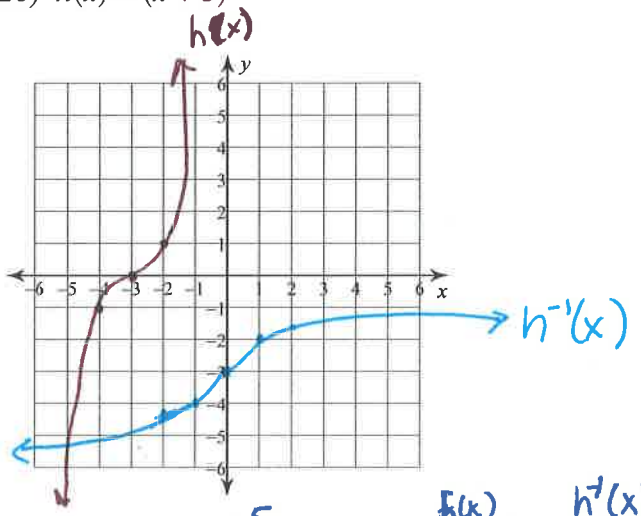
x	y
-3	1
-2	.7937
-1	0
0	-7.937
1	-1
2	-1.145
3	-1.26

f(x)

x	y
-3	53
-2	15
-1	1
0	-1
1	-3
2	-17
3	-55

$f^{-1}(x)$

26) $h(x) = (x+3)^5$



$x = (y+3)^5$

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

$h^{-1}(x) = \sqrt[5]{x} - 3$

h(x)

x	y
-5	-32
-4	-1
-3	0
-2	1
-1	32

$h^{-1}(x)$

x	y
-2	-4.149
-1	-4
0	-3
1	-2
2	-1.851

College Algebra CHS

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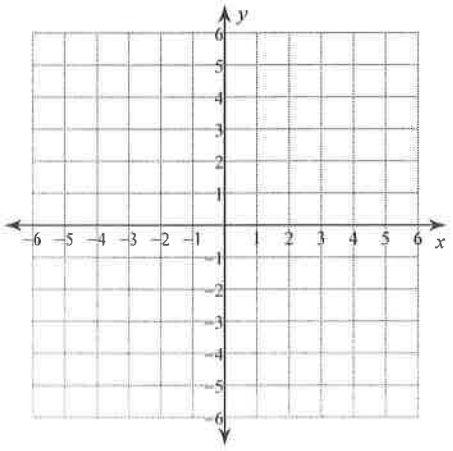

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