4.1 WS 3

KEY

Use the composition of functions to determine whether *f* and *g* are inverses of one another.

1. $f(x)=-2x+5;\ g(x)=\dfrac{x-5}{-2}$

$f(g(x)) = -2\left(\frac{x-5}{-2}\right)+5 = x-5+5 = x$

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

yes

2. $f(x)=\sqrt[3]{x}-5;\ g(x)=(x+5)^3$

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

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

yes

3. $f(x)=4x+1;\ g(x)=\dfrac{1}{2}x+\dfrac{1}{4}$

$f(g(x)) = 4\left(\frac{1}{2}x+\frac{1}{4}\right)+1 = 2x+1+1 = 2x+2$

No

4. $f(x)=\dfrac{2x}{x-1};\ g(x)=\dfrac{x}{x-3}$

$f(g(x)) = \dfrac{2\left(\frac{x}{x-3}\right)}{\frac{x}{x-3}-\frac{x-3}{x-3}} = \dfrac{\frac{2x}{x-3}}{\frac{3}{x-3}}$

$= \frac{2x}{x-3}\left(\frac{x-3}{3}\right) = \frac{2}{3}x$

No

Find the inverse function of the one-to-one function given.

5. $f(x)=\{(-3,1),(-2,2),(1,5),(4,-7)\}$

$f^{-1}(x) = \{(1,-3),(2,-2),(5,1),(-7,4)\}$

6. $g(x)=\{(0,1),(1,2),(2,4),(3,8),(4,16)\}$

$g^{-1}(x) = \{(1,0),(2,1),(4,2),(8,3),(16,4)\}$

Find the inverse of each function, then state the domain and range of $f^{-1}(x)$.

7. $f(x)=4x-8$

$\frac{y+8}{4}=x$

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

D_x of $f^{-1}(x)=(-\infty,\infty)$

R_y of $f^{-1}(x)=(-\infty,\infty)$

8. $f(x)=\frac{x}{x-2}$

$yx-2y=x$

$-2y=x-yx$

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

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

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

D_x of $f^{-1}(x)=(-\infty,1)\cup(1,\infty)$

R_y of $f^{-1}(x)=(-\infty,2)\cup(2,\infty)$

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

$y^2=x-2$

$y^2+2=x$

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

D_x of $f^{-1}(x)=[0,\infty)$

R_y of $f^{-1}(x)=[2,\infty)$

10. $f(x)=\frac{x-7}{2x-1}$

$2xy-y=x-7$

$-y+7=x-2xy$

$-y+7=x(1-2y)$

$f^{-1}(x)=\frac{-x+7}{1-2x}$

D_x of $f^{-1}(x)=(-\infty,\frac{1}{2})\cup(\frac{1}{2},\infty)$

R_y of $f^{-1}(x)=(-\infty,\frac{1}{2})\cup(\frac{1}{2},\infty)$

11. The function $K(x)=1.3x-4.7$ converts a men's shoe size in the United States to the equivalent shoe size in the United Kingdom. Determine the function $K^{-1}(x)$ that can be used to convert a U.K. mesn's shoesize to its equivalent U.S. shoe size.

$y=1.3x-4.7$

$y+4.7=1.3x$

$\frac{y+4.7}{1.3}=x$

$K^{-1}(x)=\frac{x+4.7}{1.3}$

12. A catering service uses the function $c(x)=\frac{300+12x}{x}$ to determine the amount, in dollars, it charges per person for a sit-down dinner; where x is the number people in attendance..

a. Find c(30) and explain what it represents. $c(30)=\frac{300+12(30)}{30}=$ 22 people

b. Find $c^{-1}(x)$. $yx=300+12x$

$yx-12x=300$

$x(y-12)=300$

$x=\frac{300}{y-12}$

$C^{-1}(x)=\frac{300}{x-12}$

c. Use to determine how many people attended a dinner for which the cost person was \$15.

$c^{-1}(x)=\frac{300}{15-12}=$ 100 people