Name_____ Date_____ Period_____

Worksheet 2.5—Building Functions from other Functions

Give simplified, exact values for all answers. **No Calculator is Permitted unless specifically stated.**

I. Multiple Choice

_____1. If the point $(3,4)$ lies on the graph of an invertible function *f*, then which of the following points lies on the graph of its inverse?

(A) $(4,3)$ (B) $(3,-4)$ (C) $\left(3,\frac{1}{4}\right)$ (D) $(-3,4)$ (E) None of these

_____2. The inverse of the function $f(x)=7x+8$ will be

(A) $g(x)=\frac{x-8}{7}$ (B) $g(x)=\frac{1}{7x+8}$ (C) $g(x)=\frac{8}{x-7}$ (D) $g(x)=-7x-8$ (E) $g(x)=-\frac{1}{7}x+8$

_____3. If $f(x)=\sqrt{x}$ and $g(x)=x^2$, then $(gf)(x)=$

(A) $\frac{\sqrt{x}}{x}$ (B) $|x|$ (C) $x^{5/2}$ (D) x (E) $\frac{x}{\sqrt{x}}$

4. If $f(x)=\sqrt{x}$ and $g(x)=x^2$, then $(g\circ f)(x)=$

(A) $\frac{\sqrt{x}}{x}$ (B) $|x|$ (C) $x^{5/2}$ (D) x (E) $\frac{x}{\sqrt{x}}$

_____5. If $f(x)=\sqrt{x}$ and $g(x)=x^2$, then $(f\circ g)(x)=$

(A) $\frac{\sqrt{x}}{x}$ (B) $|x|$ (C) $x^{5/2}$ (D) x (E) $\frac{x}{\sqrt{x}}$

_____6. Suppose *f* and *g* are functions with domain of all real numbers. Which of the following is NOT necessarily true?

(A) $(f+g)(x)=(g+f)(x)$ (B) $(fg)(x)=(gf)(x)$ (C) $f(g(x))=g(f(x))$

(D) $(f-g)(x)=-(g-f)(x)$ (E) $(f\circ g)(x)=f(g(x))$

_____7. If $f(x)=x-7$ and $g(x)=\sqrt{4-x}$, what is the domain of $\frac{f}{g}$?

(A) $(-\infty,4)$ (B) $(-\infty,4]$ (C) $(4,\infty)$ (D) $[4,\infty)$ (E) $(4,7)\cup(7,\infty)$

_____8. If $f(x)=x^2+1$, then $(f\circ f)(x)=$

(A) $2x^2+2$ (B) $2x^2+1$ (C) x^4+1 (D) x^4+2x^2+1 (E) x^4+2x^2+2

_____9. Which of the following relations is equivalent to $y=|x|$?

(A) $y=x$ (B) $y=\sqrt{x^2}$ (C) $y^3=x^3$ (D) $y=\left(\sqrt{x}\right)^2$ (E) $x=|y|$

_____10. Let $h(x)=\dfrac{4x+5}{2x-7}$ and $f(x)=x+6$. If $h(x)=(g\circ f)(x)$, then $g(x)$ is ??

(A) $\dfrac{4x+1}{2x-13}$ (B) $\dfrac{4x-1}{2x+13}$ (C) $\dfrac{4x}{2x}-\dfrac{5}{7}$ (D) $\dfrac{4x-19}{2x-5}$ (E) None of these

II. Short Answer

11. If $f(x)=\sqrt{x+3}$ and $g(x)=\sqrt{x-4}$, find formulas for $h=:\ \dfrac{f}{g},\ \dfrac{g}{f},\ f+g,\ f\circ g$, and $g\circ f$. Give the domain of each.

12. For each of the following, find $f(g(x))$ and $g(f(x))$. Find the domain of each and decide if *f* and *g* are inverses. Give an explanation for your answers.

(a) $f(x)=\dfrac{1}{x-1},\ g(x)=\sqrt{x}$ (b) $f(x)=\dfrac{1}{x+1},\ g(x)=\dfrac{1}{x-1}$

13. Decompose each of the following functions *h* into two functions *f* and *g* such that $h(x)=f(g(x))$. Find two, different, non-trivial decompositions.

(a) $h(x)=\sqrt{x^2-5x}$ (b) $h(x)=\dfrac{3}{x^3-5x+6}$ (c) $h(x)=\sqrt{x+e^{\sqrt{x}}}$

14. Assume f is a one-to-one function.

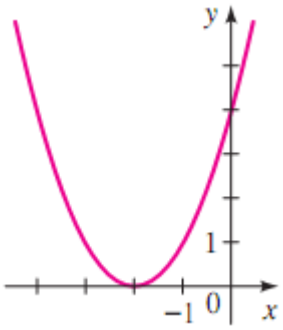
(a) If $f(2)=9$, find $f^{-1}(9)$ (b) If $f^{-1}(-3)=1$, find $f(1)$ (c) if $f(x)=5-2x$, find $f^{-1}(-3)$

15. Find the inverse, $g(x)$, of the following functions, then compose the functions to verify.

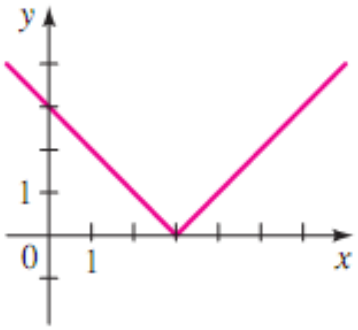
(a) $f(x)=\left(2-x^3\right)^5$ (b) $f(x)=\dfrac{2-7x}{3x-1}$

16. The following functions are not one-to-one. Restrict each's domain so that the resulting function IS one-to-one. Write an equation for each graph (assume no dilations), then find the equation of the inverse function under the restricted domain.

(a)

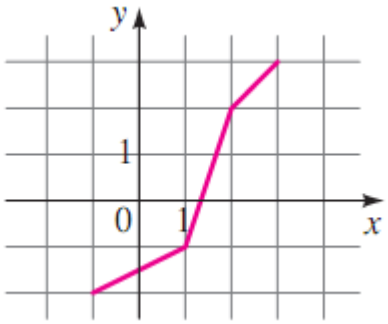


(b)

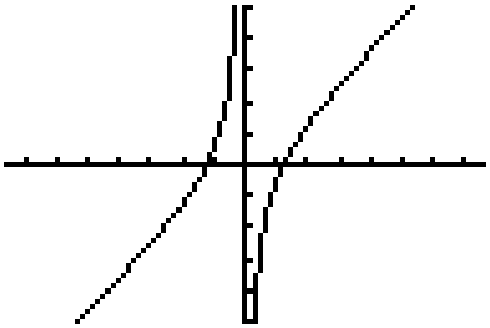


17. Use the graph of each function, *f*, to sketch the graph of f^{-1}. Assume the scales are square.

(a)



(b)



18. Korpicello's Pizza charges a base price of \$5 for a large pizza, plus \$2 for each topping.

a. Write and equation for the total cost, *C*, of a large pizza with *n* toppings.

b. Find the equation for $C^{-1}(n)$, the inverse function of $C(n)$.

c. What is practical interpretation (or what is the usefulness) of $C^{-1}(n)$?

d. What are ***your*** favorite toppings? If you only had \$10 to spend, how many, and which, toppings would you/could you get?