

Composition of Functions Worksheet

Name McG Key

I. $f(x) = 2x - 1$ $g(x) = 3x$ $h(x) = x^2 + 1$ Compute the following:

1. $f(g(x))$
 $f(3x) = 2(3x) - 1$
 $= 6x - 1$

2. $f(h(x)) = 2x^2 + 1$

3. $g(h(x))$
 $g(x^2 + 1) = 3(x^2 + 1)$
 $= 3x^2 + 3$

4. $h(f(x)) =$
 $4x^2 - 4x + 2$

5. $g(f(x))$
 $g(2x - 1) =$
 $3(2x - 1) = 6x - 3$

6. $h(g(x))$
 $h(3x) = (3x)^2 + 1$
 $= 9x^2 + 1$

7. $f(f(x))$
 $f(2x - 1)$
 $= 2(2x - 1) - 1$
 $= 4x - 2 - 1 = 4x - 3$

8. $h(h(x))$
 $h(x^2 + 1)$
 $= (x^2 + 1)^2 + 1$
 $= x^4 + 2x^2 + 1 + 1$
 $= x^4 + 2x^2 + 2$

9. $g(g(x))$
 $g(3x) = 3(3x)$
 $= 9x$

II. $f(x) = 9 - x$ $g(x) = x^2 + x$ $h(x) = x - 2$ Compute the following:

10. $g(f(x))$
 $g(9 - x)$
 $(9 - x)^2 + 9 - x$
 $81 - 18x + x^2 + 9 - x =$
 $x^2 - 19x + 90$

11. $f(g(x))$
 $f(x^2 + x)$
 $9 - (x^2 + x)$
 $9 - x^2 - x$

12. $h(f(x))$
 $h(9 - x)$
 $9 - x - 2$
 $7 - x$

13. $f(h(x))$
 $f(x - 2) =$
 $9 - (x - 2)$
 $9 - x + 2 = 11 - x$

14. $h(g(x))$
 $h(x^2 + x)$
 $= x^2 + x - 2$

15. $g(h(x))$
 $g(x - 2) =$
 $(x - 2)^2 + (x - 2)$
 $x^2 - 4x + 4 + x - 2 =$
 $x^2 - 3x + 2$

16. $g(g(x))$
 $g(x^2 + x)$
 $(x^2 + x)^2 + (x^2 + x)$
 $x^4 + 2x^3 + x^2 + x^2 + x$
 $x^4 + 2x^3 + 2x^2 + x$

17. $h(h(x))$
 $h(x - 2) =$
 $(x - 2) - 2 =$
 $x - 4$

18. $f(f(x))$
 $f(9 - x)$
 $= 9 - (9 - x)$
 $= 9 - 9 + x$
 $= x$

$$(f \circ g)(x) = f(g(x)) \Rightarrow \text{'f of g of x' } * \text{SUBSTITUTION FROM INSIDE OUT!}$$

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I. $f(x) = 2x - 1$ $g(x) = 3x$ $h(x) = x^2 + 1$

Compute the following:

1. $f(g(-3))$

$$f(-9) = 2(-9) - 1 = \boxed{-19}$$

2. $f(h(7))$

$$f(7^2 + 1) = f(50) = 2(50) - 1 = \boxed{99}$$

3. $g(h(24))$

$$g(577) = 3(577) = \boxed{1731}$$

4. $h(f(9))$

$$h(7^2 + 1) = \boxed{290}$$

5. $g(f(0))$

$$g(-1) = \boxed{-3}$$

6. $h(g(-4))$

$$h(-12) = (-12)^2 + 1 = \boxed{145}$$

7. $f(f(2))$

$$f(2 \cdot 2 - 1) = f(3) = \boxed{5}$$

8. $h(h(5))$

$$h(26) = 26^2 + 1 = \boxed{677}$$

9. $g(g(-6))$

$$g(-18) = \boxed{-54}$$

II. $f(x) = 9 - x$ $g(x) = x^2 + x$ $h(x) = x - 2$

Compute the following:

10. $g(f(3)) = \boxed{42}$

11. $f(g(4))$

$$f(16 + 4) = f(20) = \boxed{-11}$$

12. $h(f(-6)) = \boxed{13}$

13. $f(h(-3))$

$$f(-5) = \boxed{14}$$

14. $h(g(11)) = \boxed{130}$

15. $g(h(-9))$

$$g(-11) = \boxed{110}$$

16. $g(g(5))$

$$g(30) = \boxed{930}$$

17. $h(h(13))$

$$h(11) = \boxed{9}$$

18. $f(f(-8)) = \boxed{-8}$