2-2 Stapled

Name: Key Date: _____

Algebra 2 Function Operations & Compositions

If $f(x) = x^2 - 1$, $g(x) = 2x - 3$, and $h(x) = 1 - 4x$, find the following new functions, as well as any values indicated.

1. a. $(f-g)(x) =$

$(x^2-1)-(2x-3)$

$= \boxed{x^2 - 2x + 2}$

b. $(f-g)(3) =$

$(3)^2 - 2(3) + 2$

$9 - 6 + 2 = \boxed{5}$

2. a. $(g+f)(x) =$

$(2x-3)+(x^2-1)$

$= \boxed{x^2 + 2x - 4}$

b. $(g+f)(-2) =$

$(-2)^2 + 2(-2) - 4$

$4 - 4 - 4 = \boxed{-4}$

3. a. $(f+h)(x) =$

$(x^2-1)+(1-4x)$

$= \boxed{x^2 - 4x}$

b. $(f+h)(0) =$

$0^2 - 4(0) = \boxed{0}$

4. a. $(g \cdot h)(x) =$

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

$= 2x - 8x^2 - 3 + 12x$

$= \boxed{-8x^2 + 14x - 3}$

b. $(g \cdot h)(4) =$

$-8(4)^2 + 14(4) - 3$

$= -128 + 56 - 3$

$= \boxed{-75}$

5. a. $(f \cdot g)(x) =$

$(x^2-1)(2x-3)$

$= \boxed{2x^3 - 3x^2 - 2x + 3}$

b. $(f \cdot g)(-1) =$

$2(-1)^3 - 3(-1)^2 - 2(-1) + 3$

$= -2 - 3 + 2 + 3 = \boxed{0}$

6. a. $\left(\frac{f}{g}\right)(x) =$

$\boxed{\frac{x^2-1}{2x-3},\ x \neq \frac{3}{2}}$

b. $\left(\frac{f}{g}\right)(2) =$

$\frac{(2)^2-1}{2(2)-3} = \frac{3}{1} = \boxed{3}$

7. a. $\left(\frac{g}{h}\right)(x) =$

$\boxed{\frac{2x-3}{1-4x},\ x \neq \frac{1}{4}}$

b. $\left(\frac{g}{h}\right)(0) =$

$\frac{2(0)-3}{1-4(0)} = \frac{-3}{1} = \boxed{-3}$

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

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

$g(-3) = 3(-3) = -9$

$f(-9) = 2(-9) - 1$

$= -18 - 1$

$= \boxed{-19}$

2. $f(h(7))$

$h(7) = (7)^2 + 1$

$= 49 + 1 = 50$

$f(50) = 2(50) - 1$

$= 100 - 1 = \boxed{99}$

3. $g(h(24))$

$h(24) = (24)^2 + 1$

$= 576 + 1 = 577$

$g(577) = 3(577)$

$= \boxed{1731}$

4. $h(f(9))$

$f(9) = 2(9) - 1$

$= 18 - 1 = 17$

$h(17) = 17^2 + 1$

$= 289 + 1 = \boxed{290}$

5. $g(f(0))$

$f(0) = 2(0) - 1$

$= -1$

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

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

$g(-4) = 3(-4) = -12$

$h(-12) = (-12)^2 + 1$

$= 144 + 1 = \boxed{145}$

7. $f(g(h(2)))$

$h(2) = (2)^2 + 1$

$= 4 + 1 = 5$

$g(5) = 3(5) = 15$

$f(15) = 2(15) - 1$

$= 30 - 1 = \boxed{29}$

8. $h(g(f(5)))$

$f(5) = 2(5) - 1$

$= 10 - 1 = 9$

$g(9) = 3(9) = 27$

$h(27) = 27^2 + 1$

$= 729 + 1 = \boxed{730}$

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

$h(-6) = (-6)^2 + 1$

$= 36 + 1 = 37$

$f(37) = 2(37) - 1$

$= 74 - 1 = 73$

$g(73) = 3(73) = \boxed{219}$

10. $f(f(x))$

$2(2x - 1) - 1$

$= 4x - 2 - 1$

$= \boxed{4x - 3}$

11. $g(g(x))$

$3(3x)$

$= \boxed{9x}$

12. $h(h(x))$

$(x^2 + 1)^2 + 1$

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

$= x^4 + 2x^2 + 1 + 1$

$= \boxed{x^4 + 2x^2 + 2}$

Function Composition Worksheet NAME _____

For problems 1–4, use $f(x)=2x^2-x$ and $g(x)=x+6$ to find the indicated values.

1. $(f\circ g)(2)$ $2(x+6)^2-(x+6)$ $=2(x^2+12x+36)-x-6$ $=2x^2+24x+72-x-6$ $=2x^2+23x+66$ $2(2)^2+23(2)+66$ $=8+46+66$ $=120$

2. $(g\circ f)(2)$ $2x^2-x+6$ $2(2)^2-2+6$ $8-2+6=12$

3. $(f\circ g)(x)$ $2x^2+23x+66$

4. $(g\circ f)(x)$ $2x^2-x+6$

For problems 5-8, use $f(x)=\dfrac{2x+1}{3x-2}$ and $g(x)=5x-1$ to find the indicated values.

5. $(f\circ g)(2)$ $\dfrac{10(2)-1}{15(2)-5}=\dfrac{19}{25}$

6. $(g\circ f)(2)$ $\dfrac{10(2)+5}{3(2)-2}-1=\dfrac{25}{4}-1=\dfrac{21}{4}$

7. $(f\circ g)(x)$ $\dfrac{10x-1}{15x-5}$, $x\neq\frac{1}{3}$

8. $(g\circ f)(x)$ $\dfrac{10x+5}{3x-2}-1$, $x\neq\frac{2}{3}$

For problems 9–14, use the table definitions of $H(t)$ and $r(t)$ shown below to find the indicated value.

t	1.0	1.5	2.0	2.5	3.0	3.5
$H(t)$	2.8	2.6	2.5	2.0	1.0	2.2

t	2.0	2.2	2.4	2.6	2.8	3.0
$r(t)$	1.2	1.5	3.0	2.8	2.5	2.0

9. $(r\circ H)(2.5)$ 1.2

10. $(r\circ H)(1.0)$ 2.5

11. $(H\circ r)(2.2)$ 2.6

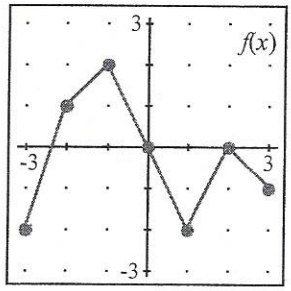
12. $(H\circ r)(3.0)$ 2.5

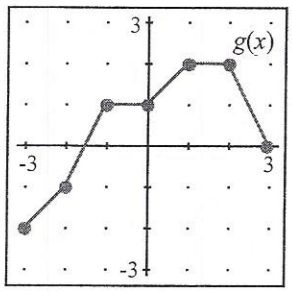
13. $(H\circ H)(2.0)$ 2.0

14. $(r\circ r)(2.4)$ 2.0

Problems 15-20 refer to the graphs of $f(x)$ and $g(x)$ shown. Find the indicated value.

(-3,-2) (1,-2) (-2,1) (2,0) (-1,2) (3,-1) (0,0)





(-3,-2) (-2,-1) (-1,1) (0,1) (1,2) (2,2) (3,0)

15. $(f\circ g)(1)$ 0

16. $(f\circ g)(-3)$ 1

17. $(g\circ f)(1)$ -1

18. $(g\circ f)(-1)$ 2

19. $(f\circ f)(3)$ 1

20. $(g\circ g)(0)$ -2

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

$g(x) = 5x-1$

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

$= \frac{10x-2+1}{15x-3-2}$

$= \frac{10x-1}{15x-5}$

$(g \circ f)(x) = 5\left(\frac{2x+1}{3x-2}\right)-1$

$= \frac{10x+5}{3x-2} - 1$