

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

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

$$\begin{aligned} f(-9) \\ = -19 \end{aligned}$$

2. $f(h(7))$

$$\begin{aligned} h(7) &= 50 \\ f(50) &= 99 \end{aligned}$$

3. $g(h(24))$

$$\begin{aligned} h(24) &= 24^2 + 1 \\ &= 577 \\ g(577) &= 1731 \end{aligned}$$

4. $h(f(9))$

$$\begin{aligned} h(17) \\ = 290 \end{aligned}$$

5. $g(f(0))$

$$\begin{aligned} g(-1) \\ = -3 \end{aligned}$$

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

$$\begin{aligned} h(-12) \\ = 145 \end{aligned}$$

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

$$\begin{aligned} h(2) &= 5 \\ g(5) &= 15 \\ f(15) &= 29 \end{aligned}$$

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

$$\begin{aligned} f(5) \\ g(10) \\ h(31) \\ = 730 \end{aligned}$$

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

$$\begin{aligned} h(-6) \\ f(-35) \\ g(-105) \\ = -219 \end{aligned}$$

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

10. $g(f(3))$

$$\begin{aligned} &g(6) \\ &= \underline{42} \end{aligned}$$

11. $f(g(4))$

$$\begin{aligned} &f(20) \\ &= \underline{-11} \end{aligned}$$

12. $h(f(-6))$

$$\begin{aligned} &h(15) \\ &= \underline{13} \end{aligned}$$

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

$$\begin{aligned} &f(-5) \\ &= \underline{14} \end{aligned}$$

14. $h(g(11))$

$$\begin{aligned} &h(132) \\ &= \underline{130} \end{aligned}$$

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

$$\begin{aligned} &g(-11) \\ &= \underline{110} \end{aligned}$$

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

$$\begin{aligned} &h(4) = 2 \\ &g(2) = \\ &\underline{6} \end{aligned}$$

17. $h(g(f(13)))$

$$\begin{aligned} &g(-4) \\ &h(12) \\ &= \underline{10} \end{aligned}$$

18. $f(g(h(-8)))$

$$\begin{aligned} &g(-10) \\ &f(90) \\ &= 7 - 90 \\ &= \underline{-83} \end{aligned}$$

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. $(f \circ g)(2)$
 $f(8) = 0$
 $f(8) = 120$

2. $(g \circ f)(2)$
 $g(4) = -2$

3. $(f \circ g)(x)$
 $2(x+6)^2 - (x+6)$
 $2(x^2 + 12x + 36) - x - 6$
 $= 2x^2 + 23x + 66$

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

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

5. $(f \circ g)(2)$
 $f(10) = \frac{21}{25}$

6. $(g \circ f)(2) = f(9) = \frac{19}{7}$
 $g(\frac{19}{7}) = \frac{2 \cdot \frac{19}{7} - 1}{\frac{19}{7} - 2} = \frac{21}{7}$

7. $(f \circ g)(x)$
 $= \frac{2(5x-1)+1}{3(5x-1)-2} = \frac{10x-1}{15x-5}$

8. $(g \circ f)(x)$
 $= 5\left(\frac{2x+1}{3x-2}\right) - 1 = \frac{10x+5}{3x-2} - 1$

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

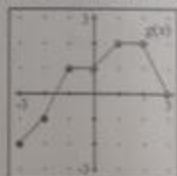
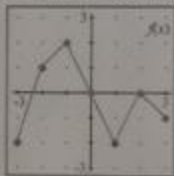
11. $(H \circ r)(2.2) = 2.6$

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.



15. $(f \circ g)(1) = -2$

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

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

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

19. $(f \circ f)(3) = 2$

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

Function Operations

Perform the indicated operation.

$$1) \begin{aligned} g(n) &= n^2 + 4 + 2n & h(n) &= -7 \\ h(n) &= -3n + 2 & g(-1) &= 1 + 4 - 2 \\ \text{Find } (g \cdot h)(1) & & &= 3 \end{aligned}$$

$$2) \begin{aligned} f(x) &= 4x - 3 & f(1) - g(4) & \\ g(x) &= x^2 + 2x & 13 - 72 & \\ \text{Find } (f - g)(4) & & = -59 & \end{aligned}$$

$$3) \begin{aligned} h(x) &= 3x + 3 & h + g(10) & \\ g(x) &= -4x + 1 & h(10) + g(10) & \\ \text{Find } (h + g)(10) & & 33 + (-19) & \\ & & = -6 & \end{aligned}$$

$$4) \begin{aligned} g(a) &= 3a + 2 & \frac{g(3)}{f(3)} &= \frac{11}{2} \\ f(a) &= 2a - 4 & \text{Find } \left(\frac{g}{f}\right)(3) & \end{aligned}$$

$$5) \begin{aligned} g(x) &= 2x - 3 & g(-1) \cdot h(-1) & \\ h(x) &= 4x + 5 & (-7)(-1) & \\ \text{Find } g(3) - h(3) & & = 135 & \\ & & -16 & \end{aligned}$$

$$6) \begin{aligned} g(a) &= 2a - 1 & g(-1) \cdot h(-1) & \\ h(a) &= 3a - 3 & (-2)(-1) & \\ \text{Find } (g \cdot h)(-4) & & = 135 & \end{aligned}$$

$$7) \begin{aligned} g(t) &= t^2 + 3 & g(-1) \cdot h(-1) & \\ h(t) &= 4t - 3 & (-1)(-7) & \\ \text{Find } (g \cdot h)(-1) & & = -28 & \end{aligned}$$

$$8) \begin{aligned} g(n) &= 3n + 2 & f(2) + 13 & \\ f(n) &= 2n^2 + 5 & g(3) = 3(3) + 2 & \\ \text{Find } g(f(2)) & & = 41 & \end{aligned}$$

$$9) \begin{aligned} g(x) &= -x^2 - 1 - 2x & \text{Find } (g - f)(x) & \\ f(x) &= x + 5 & & \end{aligned}$$

$$10) \begin{aligned} f(x) &= 3x - 1 & \text{Find } \left(\frac{f}{g}\right)(x) &= \frac{3x-1}{x^2-x} \\ g(x) &= x^2 - x & & \end{aligned}$$

$$\begin{aligned} & 3 \\ & (-x^2 - 1 - 2x) - (x + 5) \\ & = -x^2 - 3x - 6 \end{aligned}$$

$$11) \begin{aligned} g(a) &= -3a - 3 & (g + f)(a) & \\ f(a) &= a^2 + 5 & (-3a - 3) + (a^2 + 5) & \\ \text{Find } (g + f)(a) & & = a^2 - 3a - 8 & \end{aligned}$$

$$12) \begin{aligned} h(x) &= 2x + 1 & (h - g)(x) & \\ g(x) &= 2x + 2 & (2x + 1) - (2x + 2) & \\ \text{Find } (h - g)(x) & & = -1 & \end{aligned}$$

$$13) f(x) = 2x^3 - 5x^2$$

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

Find $(f \cdot g)(x)$

$$(2x^3 - 5x^2)(2x - 1)$$

$$= 4x^4 - 2x^3 - 10x^3 + 5x^2$$

$$= \underline{4x^4 - 12x^3 + 5x^2}$$

$$15) g(a) = -3a^2 - a$$

$$h(a) = -2a - 4$$

Find $\left(\frac{g}{h}\right)(a)$

$$\frac{-3a^2 - a}{-2a - 4}$$

$$\underline{\underline{\frac{-3a^2 - a}{-2a - 4}}}$$

$$17) h(a) = 3a$$

$$g(a) = -a^2 - 3$$

Find $\left(\frac{h}{g}\right)(a)$

$$\frac{3a}{-a^2 - 3}$$

$$\underline{\underline{\frac{3a}{-a^2 - 3}}}$$

$$19) h(x) = x^2 - 2$$

$$g(x) = 4x + 1$$

Find $(h \cdot g)(x)$

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

$$= \underline{4x^3 + 8x - 2}$$

$$21) g(x) = 2x - 2$$

$$f(x) = x^2 + 3x$$

Find $(g \cdot f)(-2 + x)$

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

$$= 4 - 4x + x^2 - 6 + 3x$$

$$= x^2 - 4x - 2$$

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

$$= \underline{2x^2 - 8x - 6}$$

$$14) h(n) = 4n + 5$$

$$g(n) = 3n + 4$$

Find $(h - g)(n)$

$$(4n + 5) - (3n + 4)$$

$$= \underline{n + 1}$$

$$16) f(n) = 2n$$

$$g(n) = -n - 4$$

Find $(f + g)(n)$

$$= 2(-n - 4)$$

$$= \underline{-2n - 8}$$

$$18) g(n) = 2n + 3$$

$$h(n) = n - 1$$

Find $(g + h)(n)$

$$= 2(n - 1) + 3$$

$$= \underline{2n + 1}$$

$$20) g(t) = 2t + 5$$

$$f(t) = -t^2 + 5$$

Find $(g + f)(t)$

$$(2t + 5) + (-t^2 + 5)$$

$$= \underline{-t^2 + 2t + 10}$$

$$22) g(a) = 2a + 2$$

$$h(a) = -2a - 5$$

Find $(g + h)(-4 + a)$

$$h(-4+a) = -2(-4+a) - 5$$

$$= 8 - 2a - 5$$

$$= 3 - 2a$$

$$g(3-2a) = 2(3-2a) + 2$$

$$= 6 - 4a + 2$$

$$= \underline{8 - 4a}$$