

Name: HEAD-KEY

Date: \_\_\_\_\_

Period: \_\_\_\_\_

### COMPOSITE FUNCTION WORKSHEET

**Directions:** Show all work for credit. Work must be neat and answer must be circled.

**For 1-9: Let  $f(x) = 2x - 1$ ,  $g(x) = 3x$ , and  $h(x) = x^2 + 1$ . Compute the following:**

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

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

$$f(-9) = \textcircled{-19}$$

2.  $f(h(7))$

$$h(7) = 50$$

$$f(50) = \textcircled{99}$$

3.  $(g \circ h)(24)$

$$h(24) = 577$$

$$g(577) = \textcircled{1731}$$

$$\frac{577}{3} = 192\frac{1}{3}$$

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

$$h(2) = 5$$

$$g(5) = 15$$

$$f(15) = \textcircled{29}$$

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

$$f(5) = 9$$

$$g(9) = 27$$

$$h(27) = 729 + 1 = \textcircled{730}$$

$$\frac{27}{27} = 1$$

$$\frac{9 \cdot 9}{729} = 1$$

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

$$h(-6) = 37$$

$$f(37) = 73$$

$$g(73) = \textcircled{219}$$

7.  $f(x+1)$

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

$$2x + 2 - 1 = \textcircled{2x+1}$$

8.  $g(3a)$

$$3 \cdot 3a = \textcircled{9a}$$

9.  $h(x-2)$

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

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

$$x^2 - 4x + 4 + 1 = \textcircled{x^2 - 4x + 5}$$

**For 10-11: Let  $f(x) = -3x + 7$  and  $g(x) = 2x^2 - 8$ . Compute the following:**

10.  $f(g(x))$

$$-3(2x^2 - 8) + 7$$

$$-6x^2 + 24 + 7 = \textcircled{-6x^2 + 31}$$

11.  $(g \circ f)(x)$

$$2(-3x+7)^2 - 8$$

$$2[(-3x+7)(-3x+7)] - 8$$

$$2(9x^2 - 42x + 49) - 8$$

$$18x^2 - 84x + 98 - 8 = \textcircled{18x^2 - 84x + 90}$$

12. If  $f(x) = 3x - 5$  and  $g(x) = x^2$ , find  $(f \circ g)(3)$

$$g(3) = 9$$

$$f(9) = \textcircled{22}$$

13. If  $f(x) = -9x - 9$  and  $g(x) = \sqrt{x-9}$ , find  $(f \circ g)(10)$

$$g(10) = \sqrt{1} = 1$$

$$f(1) = -9 - 9 = \textcircled{-18}$$

# Practice Worksheet

## Composition of Functions

For each pair of functions, find  $[f \circ g](2)$  and  $[g \circ f](2)$ .

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

$(f \circ g)(2) = g(2) = -6$   
 $f(-6) = -13$

$(g \circ f)(2) = f(2) = 3$   
 $g(3) = -9$

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

$(f \circ g)(2) = g(2) = 13$   
 $f(13) = 164$

$(g \circ f)(2) = f(2) = -1$   
 $g(-1) = 4$

For each pair of functions, find  $f[g(x)]$  and  $g[f(x)]$ .

3.  $f(x) = x - 8$   
 $g(x) = x + 8$

$f(g(x)) = x + 8 - 8 = x$

$g(f(x)) = x - 8 + 8 = x$

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

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

$g(f(x)) = (x^2 - x + 3) + 1 = x^2 - x + 4$

For each pair of functions, find  $f[g(-3)]$  and  $g[f(-3)]$ .

5.  $f(x) = 9$   
 $g(x) = \frac{1}{x}$

$f(g(-3)) = 9$   
 $g(-3) = -\frac{1}{3}$   
 $f(-\frac{1}{3}) = 9$

$g(f(-3)) = \frac{1}{9}$   
 $f(-3) = 9$

6.  $f(x) = \sqrt{x+5}$   
 $g(x) = 2x + 8$

$f(g(-3)) = \sqrt{2(-3)+8} = \sqrt{2}$   
 $g(-3) = 2$   
 $f(2) = \sqrt{7}$

$g(f(-3)) = 2(\sqrt{2}) + 8 = 2\sqrt{2} + 8$   
 $f(-3) = \sqrt{2}$

If  $f(x) = x^2$ ,  $g(x) = 5x$ , and  $h(x) = x + 4$ , find each value.

7.  $f[g(1)]$   
 $g(1) = 5$   
 $f(5) = 25$

8.  $g[h(-2)]$   
 $h(-2) = 2$   
 $g(2) = 10$

9.  $h[f(4)]$   
 $f(4) = 16$   
 $h(16) = 20$

10.  $f[h(-9)]$   
 $h(-9) = -5$   
 $f(-5) = 25$

Express  $g \circ f$  and  $f \circ g$ , if they exist, as sets of ordered pairs.

11.  $f = \{(3, 8), (2, 5), (4, -5), (9, 3)\}$   
 $g = \{(9, 2), (-5, 3), (5, 9), (8, 10), (1, 9)\}$

12.  $f = \{(1, 4), (10, 5), (6, -3)\}$   
 $g = \{(5, 1), (4, 6), (-3, 10)\}$

$f(4) = -5$   
 $g(9) = 2$   
 $f(g(-5)) = 8$   
 $g(f(4)) = 3$

$g \circ f = \{(1, 6), (10, 1), (6, 10)\}$   
 $f \circ g = \{(5, 4), (4, -3), (-3, 5)\}$

## Assignment

Date \_\_\_\_\_

Period \_\_\_\_\_

Perform the indicated operation.

$$1) \begin{aligned} f(t) &= t^2 - 3t \\ g(t) &= 3t - 5 \\ \text{Find } (f \cdot g)(t) &\rightarrow \end{aligned}$$

$$\begin{array}{r} (t^2 - 3t)(3t - 5) \\ 3t^3 - 5t^2 - 9t^2 + 15t \\ \hline 3t^3 - 14t^2 + 15t \end{array}$$

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

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

$$\text{Find } (f + g)(a) \rightarrow$$

$$3a^2 + 6a - 2$$

$$3) g(x) = x^3 - x$$

$$h(x) = 4x$$

$$\text{Find } (g \circ h)(x)$$

$$(4x)^3 - 4x$$

$$64x^3 - 4x$$

$$4) f(x) = -2x^2 - 3$$

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

$$\text{Find } \left(\frac{f}{g}\right)(x) \rightarrow$$

$$\begin{array}{r} 2 \overline{) \begin{array}{r} -2 \quad 0 \quad -3 \\ \underline{-4 \quad -8} \\ -2 \quad -4 \quad -11 \end{array}} \end{array}$$

$$-2x - 4 - \frac{11}{x-2}$$

$$5) g(n) = 3n^2 + 5n - 3$$

$$f(n) = n^2 - n + 4$$

$$\text{Find } (g + f)(n)$$

$$4n^2 + 4n + 1$$

$$6) g(x) = 2x^3 + 4x^2 - 3x - 1$$

$$h(x) = x + 3$$

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

$$\begin{array}{r} -3 \overline{) \begin{array}{r} 2 \quad 4 \quad -3 \quad -1 \\ \underline{-6 \quad 6 \quad -9} \\ 2 \quad -2 \quad 3 \quad -10 \end{array}} \end{array}$$

$$2x^2 - 2x + 3 - \frac{10}{x+3}$$

$$7) g(x) = 3x - 4$$

$$f(x) = -4x - 2$$

$$\text{Find } (g \cdot f)(x)$$

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

$$-12x^2 + 16x - 6x + 8$$

$$-12x^2 + 10x + 8$$

$$8) h(n) = n - 4$$

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

$$\text{Find } (g \circ h)(n)$$

$$3(n-4)^2 - (n-4)$$

$$3(n^2 - 8n + 16) - n + 4$$

$$3n^2 - 24n + 48 - n + 4$$

$$3n^2 - 25n + 52$$

$$9) f(x) = 3x + 4$$

$$g(x) = x^3 + 4x$$

$$\text{Find } (f - g)(x)$$

$$-x^3 - x + 4$$

$$10) g(t) = 4t + 1$$

$$h(t) = -t^2 - 3$$

$$\text{Find } (g \circ h)(t)$$

$$4(-t^2 - 3) + 1$$

$$-4t^2 - 12 + 1$$

$$-4t^2 - 11$$