

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

$h(24) = 577$

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

$\frac{577}{3}$   
1731

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

$h(2) = 5$

$g(5) = 15$

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

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

$f(5) = 9$

$g(9) = 27$

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

$\frac{57}{27}$   
 $\frac{174}{9}$   
 $\frac{574}{729}$

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

$h(-6) = 37$

$f(37) = 73$

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

7.  $f(x+1)$

$2(x+1) - 1$

$2x + 2 - 1$

$2x + 1$

8.  $g(3a)$

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

9.  $h(x-2)$

$(x-2)^2 + 1$

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

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

$x^2 - 4x + 5$

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

10.  $f(g(x))$

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

$-6x^2 + 24 + 7$

$-6x^2 + 31$

11.  $(g \circ f)(x)$   $2(-3x+7)^2 - 8$

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

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

$18x^2 - 84x + 98 - 8$

$18x^2 - 84x + 90$

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

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

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

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

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

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

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

Perform the indicated operation.

1)  $f(t) = t^2 - 3t$   
 $g(t) = 3t - 5$   
 Find  $(f \cdot g)(t)$  →  $(t^2 - 3t)(3t - 5)$   
 $3t^3 - 5t^2 - 9t^2 + 15t$   
 $3t^3 - 14t^2 + 15t$

2)  $f(a) = 3a^2 + 2a$   
 $g(a) = 4a - 2$   
 Find  $(f + g)(a)$  →  $3a^2 + 6a - 2$

3)  $g(x) = x^3 - x$   
 $h(x) = 4x$   
 Find  $(g \circ h)(x)$   
 $(4x)^3 - 4x$   
 $64x^3 - 4x$

4)  $f(x) = -2x^2 - 3$   
 $g(x) = x - 2$   
 Find  $\left(\frac{f}{g}\right)(x)$  →  $\begin{array}{r} -2 \quad 0 \quad -3 \\ \downarrow -4 \quad -8 \\ -2 \quad -4 \quad -11 \end{array}$   
 $-2x - 4 - \frac{11}{x-2}$

5)  $g(n) = 3n^2 + 5n - 3$   
 $f(n) = n^2 - n + 4$   
 Find  $(g + f)(n)$   
 $4n^2 + 4n + 1$

6)  $g(x) = 2x^3 + 4x^2 - 3x - 1$   
 $h(x) = x + 3$   
 Find  $\left(\frac{g}{h}\right)(x)$  →  $\begin{array}{r} -3 \quad 2 \quad 4 \quad -3 \quad -1 \\ \downarrow -6 \quad 6 \quad -9 \\ 2 \quad -2 \quad 3 \quad -10 \end{array}$   
 $2x^2 - 2x + 3 - \frac{10}{x+3}$

7)  $g(x) = 3x - 4$   
 $f(x) = -4x - 2$   
 Find  $(g \cdot f)(x)$   
 $(-4x - 2)(3x - 4)$   
 $-12x^2 + 16x - 6x + 8$   
 $-12x^2 + 10x + 8$

8)  $h(n) = n - 4$   
 $g(n) = 3n^2 - n$   
 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)  $f(x) = 3x + 4$   
 $g(x) = x^3 + 4x$   
 Find  $(f - g)(x)$   
 $-x^3 - x + 4$

10)  $g(t) = 4t + 1$   
 $h(t) = -t^2 - 3$   
 Find  $(g \circ h)(t)$   
 $4(-t^2 - 3) + 1$   
 $-4t^2 - 12 + 1$   
 $-4t^2 - 11$