

OPERATION

THERE ARE FIVE TYPES OF OPERATIONS WITH ALGEBRAIC FUNCTIONS.

1. SUM OF FUNCTIONS
2. DIFFERENCE OF FUNCTIONS
3. PRODUCT OF FUNCTIONS
4. QUOTIENT OF FUNCTIONS
5. COMPOSITION OF FUNCTIONS

1. SUM OF FUNCTIONS

WHEN YOU ARE ASKED TO FIND THE SUM OF FUNCTIONS YOU SIMPLY ADD THE FUNCTIONS TOGETHER.

$$f(x) = 2x + 1 \quad \text{and} \quad g(x) = (-3x) + 4$$

$$\text{find } (f+g)(x) \rightarrow f(x) + g(x)$$

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

$$\underline{2x + 1} + \underline{(-3x) + 4} \quad \text{Combine like terms}$$

$$(f+g)(x) = \begin{array}{c} (-1x) + 5 \\ \text{OR} \\ -x + 5 \end{array}$$

2. DIFFERENCE OF FUNCTIONS

$$f(x) = 2x + 1 \quad \text{and} \quad g(x) = (-3x) + 4$$

$$\text{find } (f-g)(x) \rightarrow f(x) - g(x)$$

SUBTRACT THE TWO FUNCTIONS

$$(2x + 1) - [(-3x) + 4]$$

$$2x + 1 + (-1)[(-3x) + 4] \quad \begin{array}{l} \text{change subtraction to} \\ \text{addition take the opposite} \\ \text{of the terms to the right.} \\ \text{multiply } (-1) \text{ to each term.} \end{array}$$

$$\underline{2x + 1} + \underline{3x} + \underline{(-4)}$$

$$(f-g)(x) = 5x + (-3)$$

3. PRODUCT OF FUNCTIONS

$$f(x) = 2x + 1 \quad \text{and} \quad g(x) = (-3x) + 4$$

find $(fg)(x) \rightarrow f(x)g(x)$ MULTIPLY THE TWO FUNCTIONS

$$(2x+1)[(-3x)+4]$$

$$(fg)(x) = (-6x^2) + 5x + 4$$

$$\begin{array}{r} 2x + 1 \\ (-3x) + 4 \\ \hline 8x + 4 \\ (-6x^2) + (-3x) \\ \hline (-6x^2) + 5x + 4 \end{array}$$

4. QUOTIENT OF FUNCTIONS

$$f(x) = 2x + 1 \quad \text{and} \quad g(x) = (-3x) + 4$$

find $(f/g)(x) \rightarrow \frac{f(x)}{g(x)}$

$$(f/g)(x) = \frac{2x+1}{(-3x)+4}$$

$$(f/g)(2) = \frac{2(2)+1}{(-3)(2)+4} = \frac{4+1}{(-6)+4} = \frac{5}{-2} = \frac{-5}{2}$$

5. COMPOSITION OF FUNCTIONS - IN SHORT COMPOSITE FUNCTIONS

$$f(x) = 2x + 1 \quad \text{and} \quad g(x) = (-3x) + 4$$

$(f \circ g)(x) \rightarrow$ means g is inside of f .
Substitute the equation for g where x is in the function of f .

$$(f \circ g)(x) = 2[(-3x) + 4] + 1$$

$$(-6x) + 8 + 1$$

$$(f \circ g)(x) = (-6x) + 9$$

Now, let's look at $(g \circ f)(x)$ $(g \circ f)(x) = (-3)(2x+1) + 4$

$$(-6x) + (-3) + 4$$

$$(g \circ f)(x) = (-6x) + 1$$

CW43 - Evaluations and Operations of Functions

Period _____

Evaluate each function.

1) $h(x) = x^2 + 5x$; Find $h(-2)$

2) $g(n) = n^2 + 3n$; Find $g(7)$

3) $p(t) = -2t - 1$; Find $p(8)$

4) $h(a) = a^3 + 5a^2$; Find $h(-7)$

5) $w(n) = 4n + 2$; Find $w(0)$

6) $p(t) = t^3 + 5t^2$; Find $p(3t)$

7) $h(n) = 4n + 2$; Find $h\left(\frac{n}{3}\right)$

8) $k(x) = 3x^2 + 1$; Find $k(x - 1)$

9) $h(x) = x^2 + x$; Find $h(z)$

10) $f(x) = x^3 + 3x$; Find $f(x^2)$

Perform the indicated operation.

11) $g(x) = x^2 - 1 + 2x$
 $f(x) = -2x + 5$
Find $(g \circ f)(x)$

12) $f(t) = 3t + 5$
 $g(t) = 4t + 4$
Find $(f + g)(t)$

13) $f(a) = -2a - 4$
 $g(a) = a^2 + a$
Find $(f - g)(a)$

14) $h(x) = -3x - 5$
 $g(x) = x^3 - 3x$
Find $\left(\frac{h}{g}\right)(x)$

15) $f(x) = 3x + 5$
 $g(x) = 3x + 4$
Find $(f + g)(x)$

16) $h(x) = 4x + 5$
 $g(x) = x^3 + 1$
Find $(h - g)(x)$

17) $g(n) = 3n$
 $h(n) = n^2 - 2n$
Find $(g + h)(n)$

18) $f(n) = n - 4$
 $g(n) = n^2 + 4$
Find $(f \cdot g)(n)$

19) $g(x) = 3x - 1$
 $h(x) = x^2 + 5x$
Find $(g - h)(x)$

20) $f(n) = 3n$
 $g(n) = 2n - 2$
Find $(3f + 2g)(n)$

21) $h(n) = n - 3$
 $g(n) = n^2 - 1$
Find $(2h - 5g)(2)$

22) $h(x) = -3x - 5$
 $g(x) = 3x - 4$
Find $\left(\frac{h}{g}\right)(6)$

23) $h(x) = 2x + 1$
 $g(x) = -2x^2 + 2$
Find $\left(\frac{h}{g}\right)(6)$

24) $h(x) = 4x + 4$
 $g(x) = -3x + 1$
Find $(h + g)(4)$

25) $f(a) = 4a + 1$
 $g(a) = a^2 + 3$
Find $(f \circ g)(-4)$

Answers to CW43 - Evaluations and Operations of Functions

1) -6

5) 2

9) $z^2 + z$

13) $-a^2 - 3a - 4$

17) $n^2 + n$

21) -17

25) 77

2) 70

6) $27t^3 + 45t^2$

10) $x^6 + 3x^2$

14) $\frac{-3x - 5}{x^3 - 3x}$

18) $n^3 - 4n^2 + 4n - 16$

22) $-\frac{23}{14}$

3) -17

7) $2 + \frac{4}{3}n$

11) $4x^2 - 24x + 34$

15) $6x + 9$

19) $-x^2 - 2x - 1$

23) $-\frac{13}{70}$

4) -98

8) $3x^2 - 6x + 4$

12) $7t + 9$

16) $-x^3 + 4x + 4$

20) $13n - 4$

24) 9

HW43 - Evaluations and Operations of Functions

Period _____

Evaluate each function.

1) $g(n) = n^2 - 5n$; Find $g(-5)$

2) $f(x) = x - 4$; Find $f(9)$

3) $h(n) = -3n^2 + 2$; Find $h(-2)$

4) $g(x) = x^3 - 4$; Find $g(-4)$

5) $f(a) = 3a - 2$; Find $f(-1)$

6) $h(x) = 3x + 1$; Find $h(-9)$

7) $k(x) = x^2 - 5x$; Find $k(-6)$

8) $g(a) = a^3 + 3a^2$; Find $g(-2)$

9) $f(a) = -a^2 - 5$; Find $f(-2)$

10) $f(n) = -n - 2$; Find $f(-5)$

11) $g(n) = n^2 - n$; Find $g(6)$

12) $h(x) = 2x^2 - 5$; Find $h(-7)$

13) $g(x) = -3x$; Find $g(5)$

14) $k(x) = x^2 - x$; Find $k(-7)$

15) $w(t) = -3t + 4$; Find $w(-10)$

16) $w(a) = a^3 + 2$; Find $w(a - 1)$

17) $h(a) = a^2 + 5$; Find $h(a^2)$

18) $h(t) = t^3 + 4t^2$; Find $h(t + 1)$

19) $k(n) = -n^2 - 2n$; Find $k\left(\frac{n}{4}\right)$

20) $h(x) = x^3 - 1$; Find $h\left(\frac{x}{2}\right)$

21) $f(n) = 3n - 1$; Find $f(-3n)$

22) $w(x) = 3x - 5$; Find $w(-4x)$

23) $h(n) = 3n + 2$; Find $h(3n)$

24) $p(x) = x^2 - 3x$; Find $p(x - 1)$

25) $w(a) = -3a^3 - 1$; Find $w(1 + a)$

26) $p(n) = -3n^2 + 5$; Find $p(4n)$

27) $h(x) = x^3 + 5$; Find $h(-2n)$

28) $f(n) = 3n + 4$; Find $f(n + 1)$

29) $h(x) = -x^2 - 3x$; Find $h(x + 4)$

30) $f(x) = -3x^3 - 4x^2$; Find $f(2x)$

Perform the indicated operation.

31) $f(a) = 4a$
 $g(a) = -a - 4$
Find $(3f + g)(a)$

32) $g(x) = x + 3$
 $f(x) = -3x + 5$
Find $(g \cdot f)(x)$

33) $f(a) = 2a - 1$
 $g(a) = -2a^2 + 4a$
Find $(f \circ g)(a)$

34) $f(x) = 3x + 3$
 $g(x) = x + 1$
Find $(f + g)(x)$

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

36) $h(x) = -3x - 1$
 $g(x) = x^2 + 1$
Find $(h \circ g)(x)$

$$37) \begin{aligned} g(x) &= 2x \\ h(x) &= x^2 + 5x \\ \text{Find } (g - h)(x) \end{aligned}$$

$$38) \begin{aligned} f(t) &= 3t + 5 \\ \text{Find } (f \circ f)(t) \end{aligned}$$

$$39) \begin{aligned} g(n) &= 3n + 4 \\ h(n) &= n + 3 \\ \text{Find } \left(\frac{g}{h}\right)(n) \end{aligned}$$

$$40) \begin{aligned} g(n) &= 3n - 5 \\ h(n) &= 3n - 4 \\ \text{Find } \left(\frac{g}{h}\right)(n) \end{aligned}$$

$$41) \begin{aligned} h(x) &= x^3 - 2x^2 \\ g(x) &= 4x - 2 \\ \text{Find } (h - g)(x) \end{aligned}$$

$$42) \begin{aligned} g(n) &= n + 3 \\ h(n) &= -4n + 3 \\ \text{Find } (-g - 4h)(n) \end{aligned}$$

$$43) \begin{aligned} f(x) &= 2x - 5 \\ g(x) &= x^2 - 1 \\ \text{Find } (f \circ g)(x) \end{aligned}$$

$$44) \begin{aligned} g(x) &= -2x + 1 \\ f(x) &= x^3 + 5x^2 \\ \text{Find } (g \circ f)(x) \end{aligned}$$

$$45) \begin{aligned} g(x) &= x^2 - 4 \\ h(x) &= -x + 1 \\ \text{Find } (g + h)(x) \end{aligned}$$

$$46) \begin{aligned} f(x) &= 3x - 5 \\ g(x) &= -3x - 4 \\ \text{Find } (f + g)(x) \end{aligned}$$

$$47) \begin{aligned} g(n) &= 2n - 1 \\ h(n) &= n^2 + 2 \\ \text{Find } (g \cdot h)(n) \end{aligned}$$

$$48) \begin{aligned} g(n) &= -n - 2 \\ f(n) &= n^2 \\ \text{Find } (g \circ f)(n) \end{aligned}$$

$$49) \begin{aligned} h(x) &= 2x + 3 \\ g(x) &= x^2 + 2x \\ \text{Find } (-5h - 4g)(x) \end{aligned}$$

$$50) \begin{aligned} g(t) &= 2t - 2 \\ f(t) &= 4t + 5 \\ \text{Find } (g \circ f)(t) \end{aligned}$$

$$51) \begin{aligned} g(n) &= 3n - 2 \\ h(n) &= -4n + 1 \\ \text{Find } (g \circ h)(10) \end{aligned}$$

$$52) \begin{aligned} g(x) &= 2x - 1 \\ f(x) &= x^3 - 2x \\ \text{Find } (g \cdot f)(0) \end{aligned}$$

$$53) \begin{aligned} f(x) &= -3x + 5 \\ g(x) &= 2x + 1 \\ \text{Find } (f \cdot g)(-3) \end{aligned}$$

$$54) \begin{aligned} h(x) &= 3x + 1 \\ g(x) &= 3x \\ \text{Find } (h \circ g)(2) \end{aligned}$$

$$55) \begin{aligned} g(t) &= 2t - 3 \\ h(t) &= t^2 - 5 \\ \text{Find } (g + h)(-1) \end{aligned}$$

$$56) \begin{aligned} g(a) &= 3a - 2 \\ h(a) &= 4a \\ \text{Find } (g - h)(0) \end{aligned}$$

$$57) \begin{aligned} g(n) &= -n + 2 \\ f(n) &= n^3 - 1 \\ \text{Find } (g + f)(1) \end{aligned}$$

$$58) \begin{aligned} g(x) &= 4x - 2 \\ f(x) &= -3x - 2 \\ \text{Find } (g \circ f)(0) \end{aligned}$$

$$59) \begin{aligned} h(n) &= 2n - 2 \\ g(n) &= 2n + 2 \\ \text{Find } (h \cdot g)(-3) \end{aligned}$$

$$60) \begin{aligned} g(n) &= 4n + 2 \\ h(n) &= 2n \\ \text{Find } (g - h)(-5) \end{aligned}$$

Answers to HW43 - Evaluations and Operations of Functions

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|-----------------------------|----------------------------|---------------------------------------|----------------------------|
| 1) 50 | 2) 5 | 3) -10 | 4) -68 |
| 5) -5 | 6) -26 | 7) 66 | 8) 4 |
| 9) -9 | 10) 3 | 11) 30 | 12) 93 |
| 13) -15 | 14) 56 | 15) 34 | 16) $a^3 - 3a^2 + 3a + 1$ |
| 17) $a^4 + 5$ | 18) $t^3 + 7t^2 + 11t + 5$ | 19) $-\frac{1}{16}n^2 - \frac{1}{2}n$ | 20) $-1 + \frac{1}{8}x^3$ |
| 21) $-9n - 1$ | 22) $-12x - 5$ | 23) $9n + 2$ | 24) $x^2 - 5x + 4$ |
| 25) $-4 - 9a - 9a^2 - 3a^3$ | 26) $-48n^2 + 5$ | 27) $-8n^3 + 5$ | |
| 28) $3n + 7$ | 29) $-x^2 - 11x - 28$ | 30) $-24x^3 - 16x^2$ | 31) $11a - 4$ |
| 32) $-3x^2 - 4x + 15$ | 33) $-4a^2 + 8a - 1$ | 34) $4x + 4$ | 35) $n^3 + 2n - 3$ |
| 36) $-3x^2 - 4$ | 37) $-x^2 - 3x$ | 38) $9t + 20$ | 39) $\frac{3n + 4}{n + 3}$ |
| 40) $\frac{3n - 5}{3n - 4}$ | 41) $x^3 - 2x^2 - 4x + 2$ | 42) $15n - 15$ | 43) $2x^2 - 7$ |
| 44) $-2x^3 - 10x^2 + 1$ | 45) $x^2 - x - 3$ | 46) -9 | 47) $2n^3 - n^2 + 4n - 2$ |
| 48) $-n^2 - 2$ | 49) $-4x^2 - 18x - 15$ | 50) $8t + 8$ | 51) -119 |
| 52) 0 | 53) -70 | 54) 19 | 55) -9 |
| 56) -2 | 57) 1 | 58) -10 | 59) 32 |
| 60) -8 | | | |