

## Functions Operations &amp; Composition

Perform the indicated operation.

- 1)  $g(x) = 4x - 4$   
 $f(x) = 3x^2 - 5x$   
 Find  $(g + f)(x)$   
 $4x - 4 + 3x^2 - 5x$   
 $3x^2 - x - 4$
- 2)  $g(t) = t^2 + 3t$   
 $f(t) = 3t + 3$   
 Find  $(g - f)(t)$   
 $t^2 + 3t - (3t + 3)$   
 $t^2 - 3$
- 3)  $g(x) = x - 2$   
 $h(x) = x^3 - 2$   
 Find  $(g - h)(x)$   
 $x - 2 - (x^3 - 2)$   
 $-x^3 + x$
- 4)  $g(n) = 3n$   
 $h(n) = -3n^3 + 3$   
 Find  $(g + h)(n)$   
 $3n - 3n^3 + 3$   
 $-3n^3 + 3n + 3$
- 5)  $g(n) = 2n - 1$   
 $h(n) = -3n + 5$   
 Find  $(g - h)(-6)$   
 $2n - 1 - (-3n + 5)$   
 $(g - h)(-6) = 5(-6) - 6 = -36$
- 6)  $f(x) = -4x + 2$   
 $g(x) = -x^2 - 4x$   
 Find  $(f - g)(8)$   
 $-4x + 2 - (-x^2 - 4x)$   
 $x^2 + 2$   
 $(f - g)(8) = 8^2 + 2 = 66$
- 7)  $f(n) = -n^2 - n$   
 $g(n) = 4n - 5$   
 Find  $(f + g)(-3n)$   
 $-n^2 - n + 4n - 5$   
 $-n^2 + 3n - 5$   
 $(f + g)(-3n) = -(-3n)^2 + 3(-3n) - 5$   
 $-9n^2 - 9n - 5$
- 8)  $f(x) = 3x$   
 $g(x) = x^2 - 5x$   
 Find  $(f - g)(2x)$   
 $3x - (x^2 - 5x)$   
 $-x^2 + 8x$   
 $(f - g)(2x) = -(2x)^2 + 8(2x)$   
 $-4x^2 + 16x$
- 9)  $g(n) = n^2 - 5n$   
 $f(n) = 3n + 1$   
 Find  $(g - f)\left(\frac{n}{4}\right)$   
 $n^2 - 5n - (3n + 1)$   
 $n^2 - 8n - 1$   
 $(g - f)\left(\frac{n}{4}\right) = \left(\frac{n}{4}\right)^2 - 8\left(\frac{n}{4}\right) - 1$   
 $\frac{n^2}{16} - 2n - 1$
- 10)  $g(n) = 3n + 3$   
 $h(n) = n^2 + 5n$   
 Find  $(g + h)(n^2)$   
 $3n + 3 + n^2 + 5n$   
 $n^2 + 8n + 3$   
 $(g + h)(n^2) = (n^2)^2 + 8(n^2) + 3$   
 $n^4 + 8n^2 + 3$
- 11)  $g(x) = -2x - 5$   
 $f(x) = 2x - 3$   
 Find  $\left(\frac{g}{f}\right)(x)$   
 $\frac{-2x - 5}{2x - 3}$
- 12)  $g(n) = 4n - 2$   
 $h(n) = n^2 - 3$   
 Find  $\left(\frac{g}{h}\right)(n)$   
 $\frac{4n - 2}{n^2 - 3}$
- 13)  $g(a) = -2a^2 - 4$   
 $h(a) = 3a - 2$   
 Find  $(g \cdot h)(a)$   
 $(-2a^2 - 4)(3a - 2)$   
 $-6a^3 + 4a^2 - 12a + 8$
- 14)  $g(x) = 4x + 5$   
 $h(x) = -x$   
 Find  $\left(\frac{g}{h}\right)(x)$   
 $\frac{4x + 5}{-x}$

15)  $g(x) = 3x^2 - 5x$   
 $h(x) = 2x + 4$

Find  $\left(\frac{g}{h}\right)(8)$

$$\frac{3x^2 - 5x}{2x + 4}$$

$$\left(\frac{g}{h}\right)(8) = \frac{3(8)^2 - 5(8)}{2(8) + 4} = \frac{38}{5}$$

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

Find  $(g \cdot h)(-7)$

$$(2x-2)(x-2)$$

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

$$(g \cdot h)(-7) = 2(-7)^2 - 6(-7) + 4$$

$$98 + 42 + 4 = 144$$

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

Find  $\left(\frac{f}{g}\right)(n+4)$

$$\frac{-n^2 - 3n}{n+1}$$

$$\left(\frac{f}{g}\right)(n+4) = \frac{-(n+4)^2 - 3(n+4)}{(n+4) + 1}$$

$$= \frac{-(n^2 + 8n + 16) - 3n - 12}{n+5} = \frac{-n^2 - 11n - 28}{n+5}$$

18)  $g(t) = 4t + 2$   
 $f(t) = t + 1$

Find  $\left(\frac{g}{f}\right)(t^2)$

$$\frac{4t+2}{t+1}$$

$$\left(\frac{g}{f}\right)(t^2) = \frac{4t^2+2}{t^2+1}$$

19)  $f(n) = -2n - 5$   
 $g(n) = 2n + 5$

Find  $(3f - 4g)(n)$

$$3(-2n-5) - 4(2n+5)$$

$$-6n - 15 - 8n - 20$$

$$-14n - 35$$

20)  $g(t) = -4t + 5$   
 $f(t) = 3t^2 - 2$

Find  $(3g + 2f)(t)$

$$3(-4t+5) + 2(3t^2-2)$$

$$-12t + 15 + 6t^2 - 4$$

$$6t^2 - 12t + 11$$

21)  $f(n) = n^3 - 5$   
 $g(n) = 3n + 3$

Find  $(4f + g)(n)$

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

$$4n^3 - 20 + 3n + 3$$

$$4n^3 + 3n - 17$$

22)  $f(t) = t + 4$   
 $g(t) = t^3 + 2t^2 - 2t$

Find  $(-2f + g)(t)$

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

$$-2t - 8 + t^3 + 2t^2 - 2t$$

$$t^3 + 2t^2 - 4t - 8$$

23)  $g(x) = 4x - 4$   
 $h(x) = 4x + 4$

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

$$4(4x+4) - 4$$

$$16x + 16 - 4$$

$$16x + 12$$

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

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

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

$$-3x^3 - 3x - 2$$

25)  $f(x) = -3x$   
 $g(x) = 3x - 4$

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

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

$$-9x + 12$$

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

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

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

$$8x^2 - 4x + 2$$

27)  $f(t) = t^2 - 2$   
 $g(t) = 2t + 1$

Find  $(f \circ g)(t)$

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

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

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

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

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

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

$$8x + 8 - 1$$

$$8x + 7$$

29)  $g(a) = 2a - 5$   
 $f(a) = a^2 - a$

Find  $(g \circ f)(-4)$

$$2(a^2 - a) - 5$$

$$2a^2 - 2a - 5$$

$$(g \circ f)(-4) = 2(-4)^2 - 2(-4) - 5$$

$$2(16) + 8 - 5 = 35$$

30)  $f(x) = x^2 - 3x$   
 $g(x) = 2x - 3$

Find  $(f \circ g)(3)$

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

$$4x^2 - 12x + 9 - 6x + 9$$

$$4x^2 - 18x + 18$$

$$(f \circ g)(3) = 4(3)^2 - 18(3) + 18 = 0$$

31)  $f(n) = 2n^3 - 4$   
 $g(n) = n - 4$

Find  $(f \circ g)(-n)$

$$(f \circ g)(-n) = 2(-n)^3 - 4$$

$$-2n^3 - 4n^2 - 96n - 132$$

32)  $g(x) = x - 4$   
 $f(x) = x^3 + 5$

Find  $(g \circ f)(3x)$

$$(x^3+5) - 4$$

$$x^3 + 1$$

$$(g \circ f)(3x) = (3x)^3 + 1$$

$$= 27x^3 + 1$$

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

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$$5) \begin{aligned} g(n) &= 2n - 1 \\ h(n) &= -3n + 5 \\ \text{Find } (g - h)(-6) \end{aligned}$$

$$6) \begin{aligned} f(x) &= -4x + 2 \\ g(x) &= -x^2 - 4x \\ \text{Find } (f - g)(8) \end{aligned}$$

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$$9) \begin{aligned} g(n) &= n^2 - 5n \\ f(n) &= 3n + 1 \\ \text{Find } (g - f)\left(\frac{n}{4}\right) \end{aligned}$$

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$$11) \begin{aligned} g(x) &= -2x - 5 \\ f(x) &= 2x - 3 \\ \text{Find } \left(\frac{g}{f}\right)(x) \end{aligned}$$

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$$14) \begin{aligned} g(x) &= 4x + 5 \\ h(x) &= -x \\ \text{Find } \left(\frac{g}{h}\right)(x) \end{aligned}$$

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 $h(x) = 2x + 4$   
 Find  $\left(\frac{g}{h}\right)(8)$

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 $h(x) = x - 2$   
 Find  $(g \cdot h)(-7)$

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 $g(n) = n + 1$   
 Find  $\left(\frac{f}{g}\right)(n + 4)$

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 $f(t) = t + 1$   
 Find  $\left(\frac{g}{f}\right)(t^2)$

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 Find  $(4f + g)(n)$

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 Find  $(-2f + g)(t)$

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 $f(x) = x^3 + 5$   
 Find  $(g \circ f)(3x)$