

Algebra RH

Essential Question: How do we evaluate composite functions?

Do Now:

Write in function notation.

a) $y = 2x + 5$

$$f(x) = 2x + 5$$

b) $C = 12n + 100$

$$C(n) = 12n + 100$$

Evaluate each function.

c) $g(n) = 4n - 5$; Find $g(6)$

$$\begin{aligned} g(6) &= 4(6) - 5 \\ &= 19 \end{aligned}$$

d) $g(n) = n^2 + 4n$; Find $g(2)$

$$\begin{aligned} g(2) &= (2)^2 + 4(2) \\ &= 4 + 8 \\ &= 12 \end{aligned}$$

Evaluate each function.

1) $k(a) = 4a + 2$; Find $k(a - 3)$

$$\begin{aligned} k(a-3) &= 4(a-3) + 2 \\ &= 4a - 12 + 2 \\ &= 4a - 10 \end{aligned}$$

2) $h(t) = -2t + 2$; Find $h(-3t)$

$$\begin{aligned} h(-3t) &= -2t + 2 \\ &= -2(-3t) + 2 \\ &= 6t + 2 \end{aligned}$$

3) $h(n) = 3n + 5$; Find $h(-4n)$

$$\begin{aligned} h(-4n) &= 3(-4n) + 5 \\ &= -12n + 5 \end{aligned}$$

4) $h(x) = x^2 + 1$; Find $h\left(\frac{x}{4}\right)$

$$\begin{aligned} h\left(\frac{x}{4}\right) &= \left(\frac{x}{4}\right)^2 + 1 \\ &= \frac{x^2}{16} + 1 \end{aligned}$$

The function pictured to the right is represented by $g(x)$.

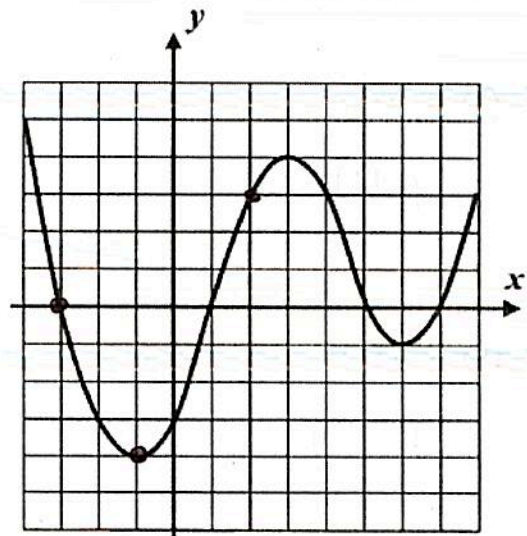
$g(2) = 3$

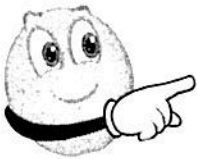
$g(-3) = 0$

What is the value of x when $g(x) = -4$? $x = -1$

For what values of x is $g(x) = 0$?

$x = -3, 1, 5, 7$





Composition of Functions

The term "composition of functions" or "composite function" refers to the combining of functions in a manner where the output from one function becomes the input for the next function (apply one rule, get a result, and then apply the second rule to what you obtained from the first rule).

The notation used for composition is:

$(f \circ g)(x) = f(g(x))$ and is read "f composed with g of x" or "f of g of x"

(1) Given:

$$\begin{aligned}f(x) &= 2x - 4 \\g(x) &= x^2\end{aligned}$$

Find:

a) $f(g(3))$

$$\begin{aligned}g(3) &= (3)^2 \\&= 9\end{aligned} \quad \rightarrow \quad \begin{aligned}f(9) &= 2(9) - 4 \\&= 14\end{aligned}$$

b) $f(g(-2))$

$$\begin{aligned}g(-2) &= (-2)^2 \\&= 4\end{aligned} \quad \rightarrow \quad \begin{aligned}f(4) &= 2(4) - 4 \\&= 4\end{aligned}$$

c) $g(f(-5))$

$$\begin{aligned}f(-5) &= 2(-5) - 4 \\&= -14\end{aligned} \quad \rightarrow \quad \begin{aligned}g(-14) &= (-14)^2 \\&= 196\end{aligned}$$

d) $(g \circ f)(7)$

$$\begin{aligned}f(7) &= 2(7) - 4 \\&= 10\end{aligned} \quad \rightarrow \quad \begin{aligned}g(10) &= (10)^2 \\&= 100\end{aligned}$$

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

$$\begin{aligned}g(10) &= \sqrt{10-9} \\&= \sqrt{1} \\&= 1\end{aligned} \quad \rightarrow \quad \begin{aligned}f(1) &= -9(1) - 9 \\&= -18\end{aligned}$$

(3) If $f(x) = -4x + 2$ and $g(x) = \sqrt{x-8}$, find $(f \circ g)(12)$

$$\begin{aligned}g(12) &= \sqrt{12-8} \\&= \sqrt{4} \\&= 2\end{aligned} \quad \rightarrow \quad \begin{aligned}f(2) &= -4(2) + 2 \\&= -6\end{aligned}$$

(4) If $f(x) = -3x + 4$ and $g(x) = x^2$, find $(g \circ f)(-2)$

$$\begin{aligned}f(-2) &= -3(-2) + 4 \\&= 10\end{aligned} \quad \rightarrow \quad \begin{aligned}g(10) &= (10)^2 \\&= 100\end{aligned}$$