

Answer on Question #55772 – Math – Algebra

Given the table below, evaluate the following:

X	-3	-2	-1	0	1	2	3	4	5
f(x)	10	20	30	40	50	60	70	80	90
g(x)	-1	-2	-3	-4	-5	-6	-7	-8	-9

- a. $(3f+2g)(1)$
b. $(f \circ g)(-1)$

Solution

Method 1

- a) A linear combination of the function equals $(\alpha f + \beta g)(x) = \alpha \cdot f(x) + \beta g(x)$. Hence
 $(3f + 2g)(1) = 3 \cdot f(1) + 2 \cdot g(1) = 3 \cdot 50 + 2 \cdot (-5) = 150 - 10 = 140$
- b) For combination functions appropriate formula is $(f \circ g)(x) = f(g(x))$. Hence
 $(f \circ g)(-1) = f(g(-1)) = f(-3) = 10$.

Method 2

From the table one can find the formula for functions $f(x)$ and $g(x)$:

$f(x) = 40 + 10x$ and $g(x) = -4 - x$. Hence

a)

$$(3f + 2g)(x) = 3 \cdot f(x) + 2 \cdot g(x) = 3(40 + 10x) + 2(-4 - x) = 112 + 28x$$
$$(3f + 2g)(1) = 112 + 28 \cdot 1 = 140$$

b)

$$(f \circ g)(x) = f(g(x)) = f(-4 - x) = 40 + 10(-4 - x) = -10x$$
$$(f \circ g)(-1) = -10 \cdot (-1) = 10$$

Answer: a) $(3f + 2g)(1) = 140$, **b)** $(f \circ g)(-1) = 10$.

Express the following function, $F(x)$ as a composition of two functions f and g .

$$F(x) = \frac{x^2}{x^2 + 4}$$

Solution

Considering the function $F(x)$ we see that it can be represented by a function where the argument is x^2 . For combination functions appropriate formula is

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

Write the function $F(x)$ in the form

$$F(x) = \frac{x^2}{x^2+4} = \frac{(x^2)}{(x^2)+4} = \frac{g(x)}{g(x)+4}, \text{ where } g(x) = x^2.$$

$$\frac{g(x)}{g(x)+4} \text{ can be represented by as function } f(g(x)) = \frac{g(x)}{g(x)+4}.$$

$$\text{Hence } f(x) = \frac{x}{x+4}$$

$$\text{As a result, } F(x) = (f \circ g)(x), \text{ where } f(x) = \frac{x}{x+4} \text{ and } g(x) = x^2.$$

$$\textbf{Answer: } F(x) = (f \circ g)(x), \text{ where } f(x) = \frac{x}{x+4} \text{ and } g(x) = x^2.$$