

Composition of Two Functions.

1. Given $f(x) = 3x + 2$, $g(x) = x^2$, $h(x) = 5 - 4x$ find

a) $f(g(3))$ b) $g(h(-2))$ c) $g(f(5))$ d) $g(g(4))$ e) $h(f(2))$ f) $h(g(-2))$ g) $f(g(x))$ h) $h(f(x))$

2. Given $f(x) = x^3$, $g(x) = 1 - x$, $h(x) = 2 - 3x$ find

i) $f(g(2))$ ii) $h(f(-2))$ iii) $g(f(-1))$ iv) $h(g(-5))$ v) $f(g(x))$ vi) $h(g(x))$

3. If $f(x) = x/2$, $g(x) = x^2/2$ and $h(x) = 2x$ find

i) $f(g(6))$ ii) $g(h(-4))$ iii) $g(f(-2))$ iv) $f(f(1))$ v) $g(f(x))$ vi) $g(h(x))$

4. If $f(x) = 4 - 7x$ and $g(x) = 3x - 2$

find $f(g(x))$ and $g(f(x))$ and solve the equation

$$f(g(x)) - g(f(x)) = 6x + 5$$

5. If $p(x) = 2x + 1$ and $q(x) = 1 - 3x$

find $p(q(x))$ and $q(p(x))$ and hence solve

$$p(q(x)) - q(p(x)) = 2x$$

Solutions

1. a) 29 b) 169 c) 289 d) 256 e) 327 f) -11 g) $3x^2 + 2$ h) $-3 + 2x$

2. i) -1 ii) 26 iii) 2 iv) -16 v) $(1 - x)^3$ vi) $3x - 1$

3. i) 9 ii) 32 iii) $1/2$ iv) $1/4$ v) $1/4x^2$ vi) $2x^2$

4. $f(g(x)) = f(3x + 2) = 4 - 7(3x + 2) = 18 - 21x$ $g(f(x)) = g(4 - 7x) = 3(4 - 7x) - 2 = 10 - 21x$
 $(18 - 21x) - (10 - 21x) = 6x + 5$

$$8 = 6x + 5$$

$$x = 1/2$$

5. $p(q(x)) = p(1 - 3x) = 2(1 - 3x) + 1 = 3 - 6x$

$$q(p(x)) = q(2x + 1) = 1 - 3(2x + 1) = -2 - 6x$$

$$(3 - 6x) - (-2 - 6x) = 2x$$

$$5 = 2x$$

$$x = 2.5$$