What you'll Learn About

$f(x) = 4x + 1$ and $g(x) = (x + 3)^2$

Find the formulas for the following and the domain of each

a) $f + g$ b) $f - g$ c) fg

a) $f + g = 4x+1 + (x+3)^2 = 4x+1 + (x+3)(x+3)$
$= 4x+1 + (x^2+3x+3x+9)$
$= x^2+10x+10$ D: $(-\infty,\infty)$

b) $f - g = 4x+1-(x+3)^2 =$
$= 4x+1-(x^2+6x+9)$
$= 4x+1-x^2-6x-9 = -x^2-2x-8$ D: $(-\infty,\infty)$

c) fg
$(4x+1)(x+3)^2$
$(4x+1)(x^2+6x+9)$
$4x^3+24x^2+36x$
$+ \quad x^2+6x+9$
$\boxed{4x^3+25x^2+42x+9}$
D: $(-\infty,\infty)$

$f(x) = \sqrt{x-6}$ and $g(x) = \cos x$

Find the formulas for the following and the domain of each

a) $f + g$ b) $f - g$ c) fg

a) $f+g = \sqrt{x-6} + \cos x$ D: $x-6 \geq 0$ $x \geq 6$
$[6,\infty)$

b) $f-g = \sqrt{x-6} - \cos x$ D: $[6,\infty)$

c) $f \cdot g = \sqrt{x-6}\cos x$ D: $[6,\infty)$

f(x) = $\sqrt{x-2}$ and g(x) = x^3

Find the formulas for the following and the domain of each $\boxed{[2, \infty)}$

a) f/g b) g/f

a) $\frac{f}{g} = \frac{\sqrt{x-2}}{x^3}$ D: $\boxed{x \neq 0}$ $x-2 \geq 0$ $\boxed{x \geq 2}$

0 2

$x=-1$ $\frac{\sqrt{-3}}{-1}$ $x=1$ $\frac{\sqrt{-1}}{1}$

$x=3$ $\frac{\sqrt{1}}{27}$

b) $\frac{g}{f} = \frac{x^3}{\sqrt{x-2}}$

sq. root in denominato no equal to 0

D: $x-2>0$

$x>2$

$\boxed{(2, \infty)}$

f(x) = $\sqrt{8-x^3}$ and g(x) = x^2

Find the formulas for the following and the domain of each

a) f/g b) g/f

a) $\frac{f}{g} = \frac{\sqrt{8-x^3}}{x^2}$ D: $x^2 \neq 0$ $x \neq 0$

$8 - x^3 \geq 0$
$+x^3 \quad +x^3$
$8 \geq x^3$
$2 \geq x$

D: $\cancel{(-\infty, 2]}$
$\boxed{(-\infty, 0) \cup (0, 2]}$

0 2

$f(-1) = \frac{\sqrt{8-(-1)^3}}{(-1)^2} = \frac{\sqrt{8+1}}{1}$

$f(1) = \frac{\sqrt{8-1^3}}{1^2} = \frac{\sqrt{7}}{1}$

$f(3) = \frac{\sqrt{8-3^3}}{3^2} = \frac{\sqrt{8-27}}{9}$

b) $\frac{g}{f} = \frac{x^2}{\sqrt{8-x^3}}$

D: $8-x^3>0$ $\boxed{(-\infty, 2)}$

$8>x^3$

x less than 2 $2>x$

Composition of functions

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

f of g

$(f \circ g)(-2) = -6$

Find $g(2)$
Plug that answer into f

$f(x) = 4x + 2$ and $g(x) = x - 4$

a) $(f \circ g)(2) = f(g(2))$

$g(2) = x - 4$
$g(2) = 2 - 4$
$g(2) = -2$

$(f \circ g)(2) = f(g(2))$
$= f(-2)$
$= 4x + 2$
$= 4(-2) + 2$
$= -6$

b) $(g \circ f)(-3) = g(f(-3))$

$= -14$

* Find $f(-3)$
* Plug that answer into g

$g(f(-3)) = g(-10)$

$f(-3) = 4(-3) + 2$
$= -10$

$g(-10) = -10 - 4$
$= -14$

$f(x) = \dfrac{2x}{5x + 3}$ and $g(x) = x^2 - 4$

a) $(f \circ g)(1) = f(g(1))$
$= f(-3)$
$= \frac{1}{2}$

$g(1) = 1^2 - 4$
$g(1) = -3$

$f(-3) = \dfrac{2(-3)}{5(-3) + 3} = \dfrac{-6}{-12} = \dfrac{1}{2}$

b) $(g \circ f)(-3) = g(f(-3))$
$= g\left(\frac{1}{2}\right)$

$g\left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^2 - 4$
$= \frac{1}{4} - 4$
$= -3.75$

$f(x) = x^2 + 2$ and $g(x) = \frac{3}{x-2}$ $\quad x \neq 2$

Find each of the following and state the domain of each

a) f(g(x))

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

$D: (-\infty, 2) \cup (2, \infty)$

b) g(f(x))

$$g(f(x)) = \frac{3}{(x^2+2)-2}$$

$$= \frac{3}{x^2}$$

$x \neq 0$

$D: (-\infty, 0) \cup (0, \infty)$

$f(x) = x^2 - 1$ and $g(x) = \sqrt{x}$ $\quad x \geq 0$

Find each of the following and state the domain of each

a) f(g(x))

$$\boxed{f(g(x)) = (\sqrt{x})^2 - 1}$$

$$= x - 1$$

$D: x \geq 0$

$[0, \infty)$

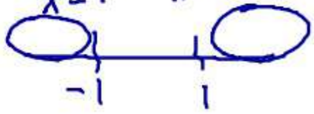
b) g(f(x))

$$g(f(x)) = \sqrt{(x^2 - 1)}$$

$x^2 - 1 \geq 0$

$x^2 \geq 1$

$x \geq 1 \quad x \leq -1$



$(-\infty, -1] \cup [1, \infty)$