PRE-CALCULUS: by Finney, Demana, Watts and Kennedy

Chapter 1: Functions and Graphs — 1.4: Building Functions from functions

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

$(4x+1)(x+3)^2$

$(4x+1)(x^2+6x+9)$

$4x^3+24x^2+36x$
$+ \quad x^2+6x+9$

$4x^3+25x^2+42x+9$

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: $[6,\infty)$

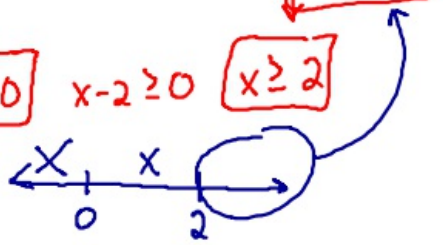
$f(x) = \sqrt{x-2}$ and $g(x) = x^3$

Find the formulas for the following and the domain of each

a) f/g b) g/f

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

D: $x \neq 0$ $x-2 \geq 0$ $x \geq 2$ $[2,\infty)$



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

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

sq. root in denominato no equal to 0

D: $x-2>0$

$x>2$

$(2,\infty)$

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

$f(x) = \sqrt{8-x^3}$ 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: $x^2 \neq 0$

$x \neq 0$

$8 - x^3 \geq 0$

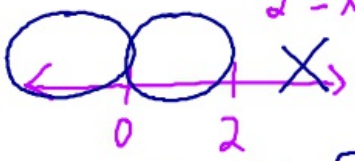
$+x^3 \quad +x^3$

$8 \geq x^3$

$2 \geq x$

D: ~~$(-\infty, 2]$~~

$(-\infty, 0) \cup (0, 2]$



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

D: $8 - x^3 > 0$

$8 > x^3$

x less than 2 $2 > x$

$(-\infty, 2)$

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

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

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

Composition of functions

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

f of g

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

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

$g(2) = x - 4$

$g(2) = 2 - 4$

$g(2) = -2$

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

$= f(-2)$

$= 4x + 2$

$= 4(-2) + 2$

$= -6$

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

Find $g(2)$

Plug that answer into f

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

$= -14$

* Find $f(-3)$

* Plug that answer into g

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

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

$= -10$

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

$= -14$

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

a) $(f \circ g)(1) = f(g(1))$

$= f(-3)$

$= \frac{1}{2}$

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

$g(1) = -3$

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

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 $g(x) = \frac{3}{x-2}$ $x \neq 2$

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 $g(x) = \sqrt{x}$ $x \geq 0$

Find each of the following and state the domain of each

a) f(g(x))

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

$= x - 1$

$D: x \geq 0$

$[0, \infty)$

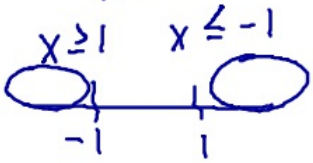
b) g(f(x))

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

$x^2 - 1 \geq 0$

$x^2 \geq 1$

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



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