Pre-Calculus

Write your questions here!

Composition of Functions

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

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

Find:

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

$\qquad = (\sqrt{2})^2 - 1$

$\qquad = 2 - 1$

$\qquad = 1$

$(g \circ f)(-4) = \sqrt{f(-4)}$

$\qquad = \sqrt{(-4)^2 - 1}$

$\qquad = \sqrt{16 - 1}$

$\qquad = \sqrt{15}$

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

$\qquad = (g)^2 - 1$

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

$\qquad = x^2 - 1$

Domain of each function
$x \geq 0$

Given: $f(x) = \frac{3}{x^2 - 5}$ and $g(x) = \sqrt{x-2}$

Find:

$f(g(2)) = \frac{3}{(g(2))^2 - 5}$

$\qquad = \frac{3}{(\sqrt{2-2})^2 - 5}$

$\qquad = \frac{3}{(\sqrt{0})^2 - 5}$

$\qquad = \frac{3}{-5}$

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

$\qquad = \frac{3}{(\sqrt{x-2})^2 - 5}$

$\qquad = \frac{3}{x - 2 - 5}$

$\qquad = \frac{3}{x - 7}$ D: $x \geq 2, x \neq 7$

$(f \circ g)(x) = \frac{3}{x - 7}$, $[2,7) \cup (7, \infty)$

$(f \circ g)(0) = \frac{3}{(g(0))^2 - 5}$

$\qquad = \frac{3}{(\sqrt{0-2})^2 - 5}$

$\qquad = \frac{3}{(\sqrt{-2})^2 - 5}$

$\qquad = dne$ ← imaginary

Domain

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

$x - 2 \geq 0$

$x \geq 2$

$f(x) = \frac{3}{x^2 - 5}$

$x^2 - 5 \neq 0$

$x^2 \neq 5$

$x \neq \pm\sqrt{5}$

$(f \circ g)(x) = \frac{3}{x - 7}$

$x - 7 \neq 0$

$x \neq 7$

Decomposition of Functions

$$h(x) = f(g(x))$$

$h(x) = \sqrt{x^3 + 1}$

$f(x) = \sqrt{x}$

$g(x) = x^3 + 1$

$h(x) = \frac{1}{x^2 + 1}$

$f(x) = \frac{1}{x}$

$g(x) = x^2 + 1$

Operations with Functions

ADD	$f + g$	$(f+g)(x)$	$(f+g)(1)$
SUBTRACT	$f - g$	$(f-g)(x)$	$(f-g)(2)$
MULTIPLY	$f \cdot g$	$(f \cdot g)(x)$	$(f \cdot g)(-3)$
DIVIDE	$\frac{f}{g}$	$\left(\frac{f}{g}\right)(x)$	$\left(\frac{f}{g}\right)(5)$

Operations with Functions

Given: $f(x) = 2x^2 - 1$ and $g(x) = 3 - 5x$

Find:

$f + g = (2x^2-1)+(3-5x)$ Domain $(-\infty, \infty)$ $= 2x^2 - 5x + 2$ $\mathbb{R}$	$f \cdot g = (2x^2-1)(3-5x)$ Domain $(-\infty, \infty)$ $= 6x^2 - 10x^3 + 5x - 3$ $\mathbb{R}$ $= -10x^3 + 6x^2 + 5x - 3$
$(f-g)(x) =$ Domain $(-\infty, \infty)$ $= (2x^2-1)-(3-5x)$ $= 2x^2 + 5x - 2$ $\mathbb{R}$	$\dfrac{f}{g} = \dfrac{2x^2-1}{3-5x}$ Domain $\mathbb{R}, x \neq \frac{3}{5}$ $\underline{\text{Denom} \neq 0}$ $3 - 5x \neq 0$ $3 \neq 5x$ $\frac{3}{5} \neq x$

Given: $f(x) = \sqrt{x}$ and $g(x) = \sqrt{5-x}$ → $\begin{array}{l}\underline{\text{RAD} \geq 0}\\ 5 - x \geq 0 \\ 5 \geq x \\ x \leq 5 \end{array}$

Find: D: $x \geq 0$

$(f+g)(2) = f(2) + g(2)$ $= \sqrt{2} + \sqrt{5-(2)}$ $= \sqrt{2} + \sqrt{3}$	$\dfrac{f}{g} = \dfrac{\sqrt{x}}{\sqrt{5-x}}$ Domain $[0, 5)$ $\underline{\text{Denom} \neq 0}$ $\underline{\text{RAD} \geq 0}$ $\sqrt{5-x} \neq 0$ $x \geq 0$ $5 - x \neq 0$ $5 \neq x$

Graphically

$g(x)$

$f(x)$
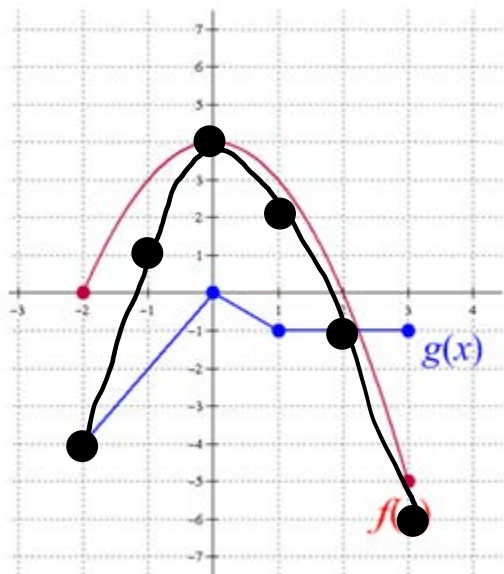
$(f+g)(2) = 0 + (-1) = -1$

$(f-g)(-1) = 3 - (-2) = 5$

$(g \cdot f)(0) = 4 \cdot (0) = 0$

$\left(\dfrac{f}{g}\right)(-2) = \dfrac{0}{-4} = 0$

$(f \circ g)(3) = f(-1) = 3$

$f + g$ (graph)

use table

x	f+g
-2	-4
-1	1
0	4
1	2
2	-1
3	-6

SUMMARY:

Now, summarize your notes here!