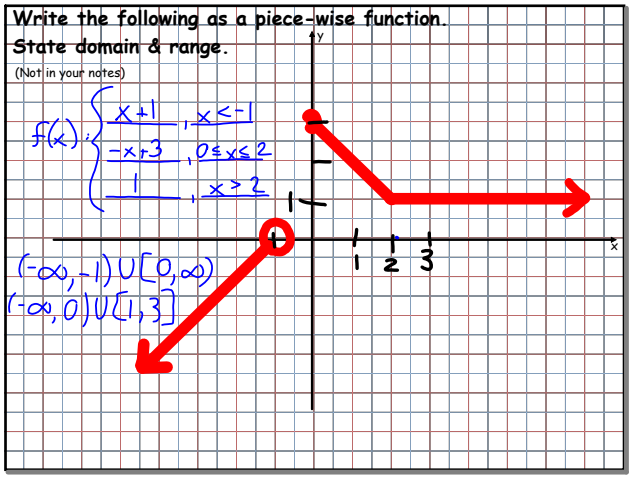
Composite Functions

See Group Work Day
for HW answers

Sep 8-4:43 PM

Write the following as a piece-wise function.
State domain & range.
(Not in your notes)



$f(x) = \begin{cases} x+1, & x \le -1 \\ -x+3, & 0 \le x \le 2 \\ 1, & x \ge 2 \end{cases}$

$(-\infty, -1) \cup [0, \infty)$
$(-\infty, 0) \cup [1, 3]$

Sep 26-12:27 PM

Warm-Up: Multiply

1. $(x-1)^2$ Answer
2. $2(x-1)^2$ Answer
3. $(2x-1)^2$ Answer

Aug 22-10:00 AM

Rules of Composition - Domain of the composite is dependent on the domains of f and g.

$(f+g)(x) = f(x)+g(x)$ $(f-g)(x) = f(x)-g(x)$ Domain is found after the intersection of the original function

$(f \cdot g)(x) = f(x) \cdot g(x)$ $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}$, $g(x) \neq 0$

$(f \cdot g)(x) \neq (f \circ g)(x)$

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

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

Domain is defined after the composition, but before you simplify

Aug 22-10:04 AM

1. If $f(x) = x^2 - 1$ and $g(x) = 2x - 4$, find each of the following.

a. $(f+g)(2) = f(2)+g(2)$
$f(2) = 2^2-1 = 3$
$g(2) = 2(2)-4 = 0$
$= 3+0 = 3$

b. $f(g(2)) = (0)^2 - 1 = -1$

c. $(f-g)(3) = f(3)-g(3)$
$f(3) = 9-1 = 8$
$g(3) = 6-4 = 2$
$= 8-2 = 6$

d. $f(2x) = (2x)^2 - 1 = 4x^2 - 1$

e. $g(3x+1) = 2(3x+1)-4$
$= 6x+2-4$
$= 6x-2$

f. $\left(\frac{f}{g}\right)(3) = \frac{f(3)}{g(3)} = \frac{8}{2} = 4$

Aug 22-10:05 AM

For 2 & 3, State domain restrictions if they exist and find the indicated compositions.

2. $f(x) = 3x$ and $g(x) = 2x^2 - 2$

a. $(f+g)(x) = f(x)+g(x)$
$= 3x+2x^2-2$
$= 2x^2+3x-2$

b. $(f-g)(x) = f(x)-g(x)$
$= 3x-(2x^2-2)$
$= 3x-2x^2+2$
$= -2x^2+3x+2$

c. $(f \cdot g)(x) = f(x) \cdot g(x)$
$= 3x(2x^2-2)$
$= 6x^3-6x$

d. $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{3x}{2x^2-2}$, $x \neq \pm 1$
$2x^2-2=0$
$x^2 = 1$
$x = \pm 1$

e. $(f \circ g)(x) = f(g(x))$
$= 3(2x^2-2)$
$= 6x^2-6$

f. $(g \circ f)(x) = g(f(x))$
$= 2(3x)^2-2$
$= 2(9x^2)-2$
$= 18x^2-2$

Aug 22-10:05 AM

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

a. $(f + g)(x) = f(x)+g(x)$
$= x+7+2x-3$
$= 3x+4$

b. $(g - f)(x) = g(x)-f(x)$
$= 2x-3-(x+7)$
$= 2x-3-x-7 = x-10$

c. $(f \cdot g)(x) = f(x)\cdot g(x)$
$= (x+7)(2x-3)$
$= 2x^2-3x+14x-21$
$= 2x^2+11x-21$

d. $\left(\frac{g}{f}\right)(x) = \frac{g(x)}{f(x)} = \frac{2x-3}{x+7}, x \neq -7$
$x+7=0$
$x=-7$

e. $(f \circ g)(x) =$
$= f(g(x)) = 2x-3+7$
$= 2x+4$

f. $(g \circ f)(x) = g(f(x)) = 2(x+7)-3$
$= 2x+14-3$
$= 2x+11$

Aug 22-10:05 AM

Sep 19-7:52 AM