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College Algebra – Extra Credit Session
March 5, 2019

Composite Functions §6.1

#12 of 20

$f(x) = \frac{8}{x-3}$ $\quad g(x) = \frac{1}{x}$

Find the composite function and state the domain for each of the following.

(a) $(f \circ g)$

Domain

[1] Start w/ all real numbers

[2] Draw the diagram

[3] Domain of 1st function alone, $g(x) = \frac{1}{x}$

$x \neq 0$

[4] Domain of 2nd function, $f(x) = \frac{8}{x-3}$

$x - 3 \neq 0$
$+3 \quad +3$
$x \neq 3$

[5] Use diagram to write two inequalities

$x \neq 0$ (domain) $\quad g(x) \neq 3$ (range)

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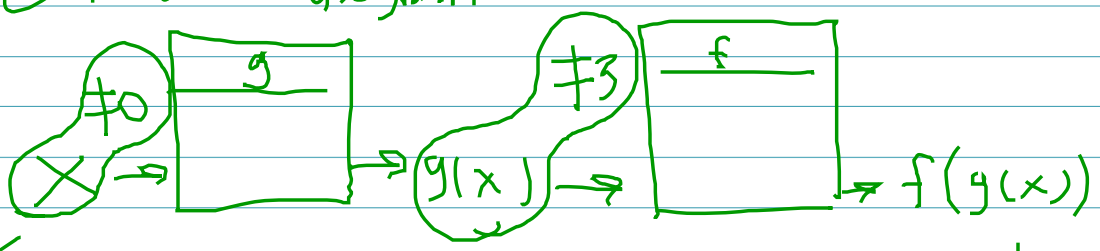

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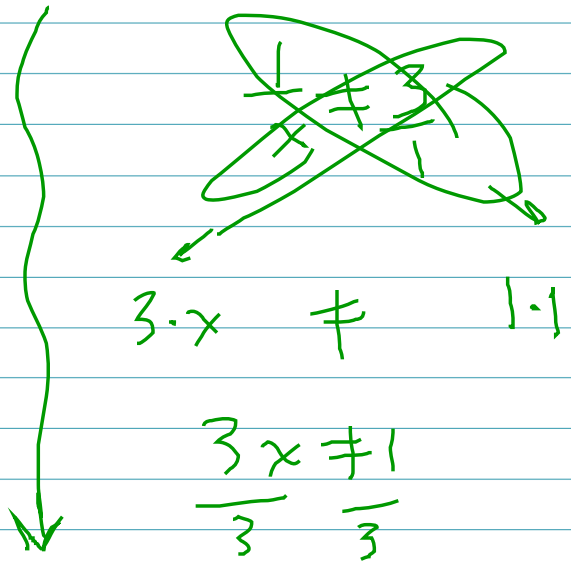
[5] Use diagram to write two inequalities

$x \neq 0$ $\quad g(x) \neq 3$

domain $\quad$ range

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

$x \neq 0$ $g(x) \neq 3$



$x \neq 0$, $x \neq \frac{1}{3}$

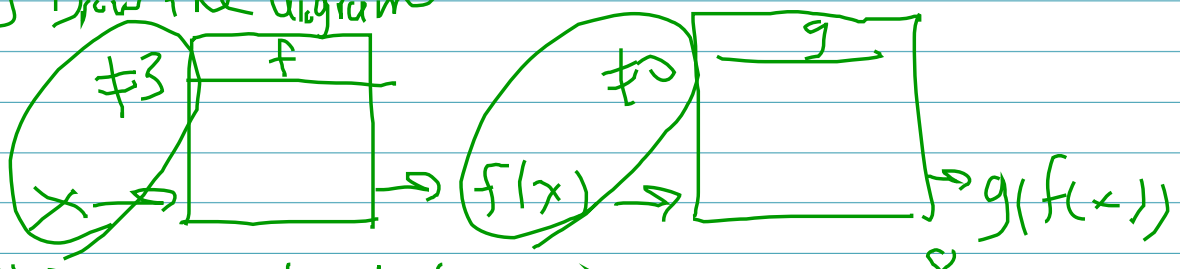
Domain: $\{x \mid x \text{ is real}, x \neq 0, x \neq \frac{1}{3}\}$

$f(x) = \frac{8}{x-3}$ $\quad g(x) = \frac{1}{x}$

Find the domain of $(g \circ f)(x)$

(1) Start w/ all real numbers $\mathbb{R}$

(2) Draw the diagram



(3) Domain of 1st function, $f(x) = \frac{8}{x-3}$ $\quad x \neq 3$

(4) Domain of 2nd function, $g(x) = \frac{1}{x}$ $\quad x \neq 0$

(5) Use diagram to write two inequalities

$x \neq 3$ — domain

$f(x) \neq 0$ — range

$\frac{8}{x-3} \neq \frac{0}{1}$

$(x-3)(0) \neq 8 \cdot 1$

$0 \neq 8$

no x, no new info about domain

$\{x \mid x \text{ is real}, x \neq 3\}$

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

$f(x) = \frac{8}{x-3}$ $\quad g(x) = \frac{1}{x}$

(a) Find $(f \circ g)(x)$

$= f(\boxed{g(x)})$

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

$= \frac{8}{\frac{1}{x} - 3}$

$= \frac{\frac{8(x)}{1(x)}}{\frac{1}{x} - \frac{3(x)}{1(x)}}$

$= \frac{\left[\frac{8x}{x}\right]}{\left[\frac{1}{x} - \frac{3x}{x}\right]}$

$(f \circ g)(x) = \frac{8x}{1-3x}$

SW

$f(x) = \frac{8}{x-3}$

$f(\square) = \frac{8}{\square - 3}$

$f(\frac{1}{x}) = \frac{8}{\frac{1}{x} - 3}$

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

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

$f(x) = \frac{8}{x-3}$ $\quad g(x) = \frac{1}{x}$

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

$= g(f(x))$

$= g\left(\frac{8}{x-3}\right)$

$= \frac{1}{\frac{8}{x-3}}$

$= \frac{\frac{1}{1}}{\frac{8}{x-3}}$ } fract keep div change fract flip

$= \frac{1}{1} \cdot \frac{x-3}{8}$

$(g \circ f)(x) = \frac{x-3}{8}$

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

$g(\square) = \frac{1}{\square}$

$g\left(\frac{8}{x-3}\right) = \frac{1}{\frac{8}{x-3}}$

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Table

x	-3	-2	-1	0	1	2	3
f(x)	-9	-6	-3	-1	3	6	9
g(x)	8	3	0	-1	0	3	8

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

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

$= f(0)$

$= -1$

$g(1)$

x is 1

g(1) is y

$g(1) = 0$

$f(0)$

x is 0

f(0) is y

$(g \circ g)(-2)$

$g(3)$

$(g \circ g)(x) = 8$