

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

1) V.A. : Reduce to lowest terms  
Take zeros of denominator

$$f(x) = \frac{12x^2 + 1}{3x(x-2)}$$

V.A.  $x=0, x=2$

2) H.A. : Take ratio of leading terms  
What happens as  $x \rightarrow \pm \infty$ ?

$$\text{As } x \rightarrow \pm \infty, y \rightarrow \frac{12x^2}{3x^2} = 4$$

H.A.  $y=4$

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Quiz Tues March 5<sup>th</sup> (6.1)

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Ch 6 : Exponential and Logarithmic Functions

6.1 Composite Functions

NOTATION

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

"f composed with g"

Ex: Let  $f(x) = x^2 - 5$  and  $g(x) = x^3 + 1$   
Find:

$$\begin{aligned} \text{a) } & (f \circ g)(x) \\ &= f(g(x)) \\ &= f(x^3 + 1) \\ &= (x^3 + 1)^2 - 5 \end{aligned}$$

Replace  $x$  in  $f$  with  $x^3 + 1$

$$\begin{aligned} \text{b) } & (g \circ f)(x) \\ &= g(f(x)) \\ &= g(x^2 - 5) \\ &= (x^2 - 5)^3 + 1 \end{aligned}$$

Replace  $x$  with  $x^2 - 5$  in  $g$

$$\begin{aligned} \text{c) } & (f \circ f)(x) \\ &= f(f(x)) \\ &= f(x^2 - 5) \\ &= (x^2 - 5)^2 - 5 \end{aligned}$$

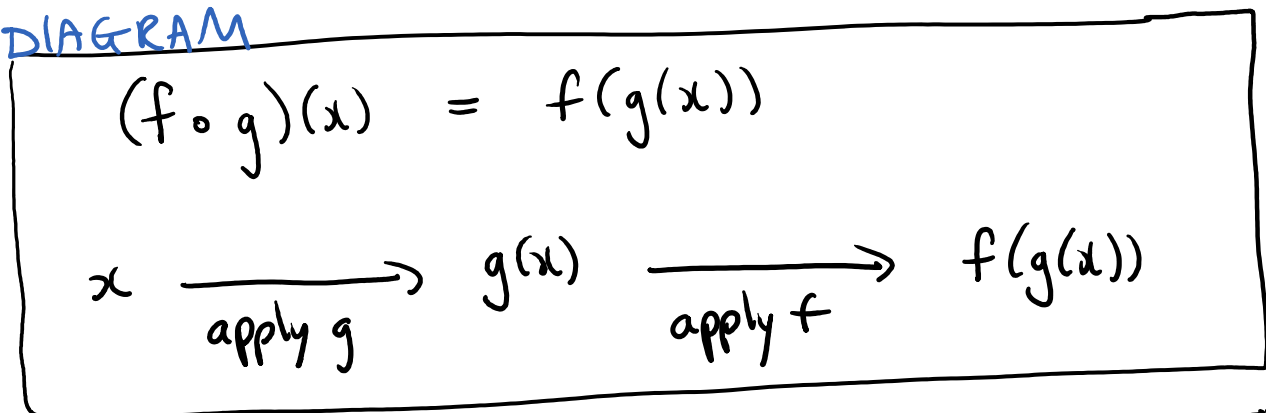
$$\begin{aligned} \text{d) } & (f \circ g)(1) \\ &= f(g(1)) \\ &= f(2) \\ &= -1 \end{aligned}$$

$$\begin{aligned} f(x) &= x^2 - 5 \\ g(x) &= x^3 + 1 \end{aligned}$$

$$\begin{aligned}
 \text{e) } (g \circ f)(1) &= g(f(1)) \\
 &= g(-4) \\
 &= (-4)^3 + 1 \\
 &= -63
 \end{aligned}$$

$$\begin{aligned}
 \text{f) } (g \circ g)(1) &= g(g(1)) \\
 &= g(2) \\
 &= 2^3 + 1 \\
 &= 9
 \end{aligned}$$

### DIAGRAM



DOMAIN of  $(f \circ g)(x)$  :

$x$  must be in the domain of  $g$

AND

$g(x)$

"

$f$

Ex: Let  $f(x) = \sqrt{x}$  and  $g(x) = \frac{1}{x-1}$

Ex: Let  $f(x) = \sqrt{x}$  and  $g(x) = \frac{1}{x-1}$   
Domain of  $f \circ g$ ?

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

$x$  must be in domain of  $g$ :

$$x \neq 1$$

AND

$g(x)$

"

$f$ :

$$g(x) \geq 0$$

$$\frac{1}{x-1} \geq 0$$

(Reciprocal Property)  $x-1 \geq 0$

$$x \geq 1$$

$$x \neq 1 \text{ and } x \geq 1$$

$$x > 1$$

Ex: Find  $f$  and  $g$  so that

$$a) (f \circ g)(x) = \sqrt{x^4 - 8}$$

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

OUTSIDE

$$g(x) = x^4 - 8$$

INSIDE

Check:  $(f \circ g)(x) = f(g(x))$   
 $= f(x^4 - 8)$   
 $= \sqrt{x^4 - 8} \quad \checkmark$

b)  $(f \circ g)(x) = \frac{1}{x^2 + 1} + 3$

Many possible correct answers

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Answer #1

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

$$f(x) = x + 3$$

Could Check

$$f(g(x)) = \frac{1}{x^2 + 1} + 3 \quad \checkmark$$


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Answer #2

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

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

Could Check

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

$$= \frac{1}{x^2 + 1} + 3 \quad \checkmark$$


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Answer #3

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

$$f(x) = \frac{1}{x+1} + 3 \quad \checkmark$$

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Answer #4  
(Cheeky)

$$g(x) = \frac{1}{x^2+1} + 3$$

$$f(x) = x \quad \checkmark$$