$f(x) = \frac{x+5}{x-6}$ $g(x) = \sqrt{x+3}$ Product $f(x)g(x)$ $(fg)(x)$ $(f \cdot g)(x)$

Domain of $f \circ g$ is BONUS.

.. .. $f(g(x))$ is

x fed to g

g(x) fed to f

Domain of $h = \{x \mid h(x) \text{ is real}\}$

$h(x) = \sqrt{x+2} \Rightarrow$

need $x+2 \geq 0$

$D(h) = \{x \mid x \geq -2\} = [-2, \infty)$

Domain of $f(g(x)) =$

$f(x) = \frac{x+5}{x-6}$ $g(x) = \sqrt{x+3}$ $x+3 \geq 0$, $x \geq -3$

$\mathcal{D}(f) = \{x \mid x \neq 6\}$ $\mathcal{D}(g) = \{x \mid x \geq -3\}$

$\{x \mid x \in \mathcal{D}(g) \text{ and } g(x) \in \mathcal{D}(f)\}$

$\mathcal{D}(f \circ g) = \{x \mid x \geq -3 \text{ AND } g(x) \neq 6\}$

$= \{x \mid x \geq -3 \text{ AND } x \neq 33\}$

$g(x) \neq 6$

$(\sqrt{x+3})^2 \neq 6^2$

$x+3 \neq 36$

$x \neq 33$

$f(x) = \frac{x+5}{x-6}$ $g(x) = \sqrt{x+3}$

$(f \circ g)(x) = f(g(x)) = \frac{g(x)+5}{g(x)-6} = \frac{\sqrt{x+3}+5}{\sqrt{x+3}-6}$

$f(\Delta) = \frac{\Delta+5}{\Delta-6}$

$f(\boxed{g(x)}) = \frac{\boxed{g(x)}+5}{\boxed{g(x)}-6}$

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$f(x) = \frac{x+5}{x-6}$ $g(x) = \sqrt{x+3}$

$D(f) = \{x \mid x \neq 6\}$

$= (-\infty, 6) \cup (6, \infty)$

$D(g) = \{x \mid x \geq -3\}$

$=$

$= [-3, \infty)$

juxtaposition = multiplication

$(f+g)(x) = \frac{x+5}{x-6} + \sqrt{x+3}$

$(fg)(x) = \left(\frac{x+5}{x-6}\right)\sqrt{x+3}$

$\left(\frac{f}{g}\right)(x) = \frac{\frac{x+5}{x-6}}{\sqrt{x+3}}$ Stop!

$\frac{x+5}{(x-6)\sqrt{x+3}}$

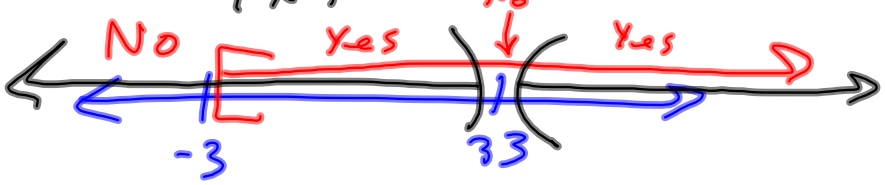
$(f \circ g)(x) = \frac{\sqrt{x+3}+5}{\sqrt{x+3}-6}$

$\mathcal{D}(f) = \{x \mid x \neq 6\}$ $\mathcal{D}(g) = \{x \mid x \geq -3\}$

$\mathcal{D}(f \circ g) = \{x \mid x \in \mathcal{D}(g) \text{ and } g(x) \in \mathcal{D}(f)\}$

$= \{x \mid x \geq -3 \text{ and } g(x) \neq 6\}$

$= \{x \mid x \geq -3 \text{ and } x \neq 33\}$

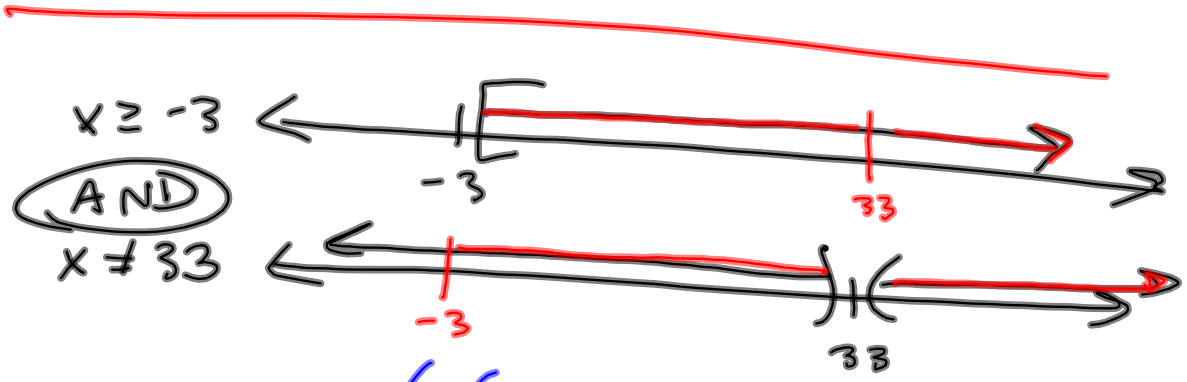


$= [-3, 33) \cup (33, \infty)$

$\sqrt{x+3} \neq 6$

$x+3 \neq 36$

$x \neq 33$



$[-3, \infty) \cap \left((-\infty, 33) \cup (33, \infty)\right)$

$= [-3, 33) \cup (33, \infty)$

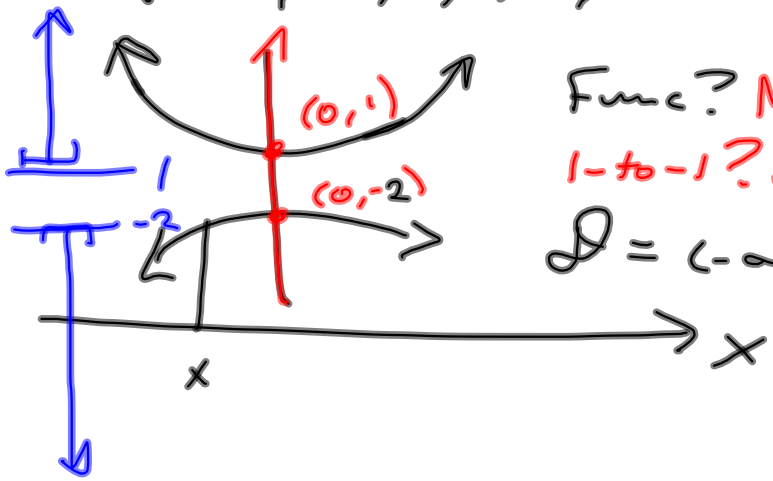
$f = \{(-1,1), (2,4), (3,2), (4,4)\}$

func.? Yes

1-to-1 ? No

$\mathcal{D} = \{-1, 2, 3, 4\}$

$\mathcal{R} = \{-1, 4, 2, 4\} = \{-1, 2, 4\}$

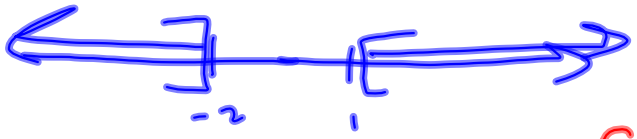


Func? No,

1-to-1? DNApply

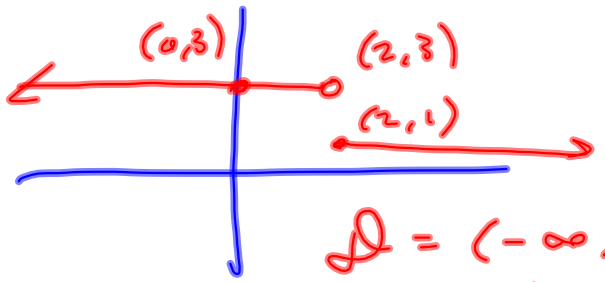
$\mathcal{D} = (-\infty, \infty)$

$\mathcal{R} = (-\infty, -2] \cup [1, \infty)$



Range.

$$f(x) = \begin{cases} 3 & \text{if } x < 2 \\ 1 & \text{if } x \geq 2 \end{cases}$$



$\mathcal{D} = (-\infty, 2) \cup [2, \infty)$

$= (-\infty, \infty)$

$\mathcal{R} = \{1, 3\}$ Pay Attention to the types of brackets

$\{\ \}$ $(\ )$

$[\ )$ $(\ ]$

$[\ ]$

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$f(x \pm k) \longrightarrow (x, y) \longrightarrow (x \mp k, y)$

$f(x) \pm k \longrightarrow (x, y) \longrightarrow (x, y \pm k)$

$k\, f(x) \longrightarrow (x, y) \longrightarrow (x, ky)$

$f(-x) \longrightarrow (x, y) \longrightarrow (-x, y)$

$-f(x) \longrightarrow (x, y) \longrightarrow (x, -y)$

Bonus $f(kx) \longrightarrow (x, y) \longrightarrow \left(\frac{1}{k}x, y\right)$

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