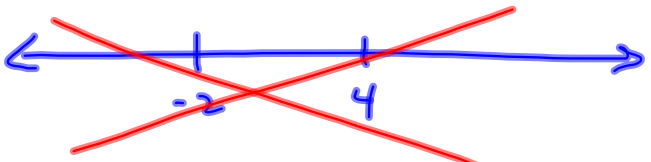
$f(x) = \frac{x-1}{x+2}$, $g(x) = \sqrt{x+4}$

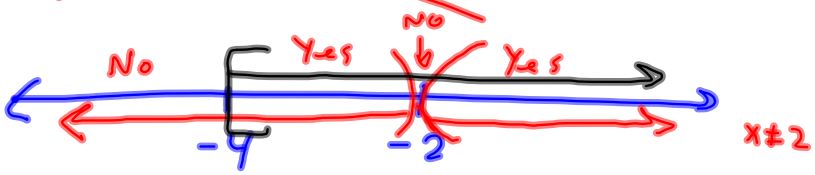
$\mathcal{D}(f)$: Need $x+2 \neq 0$ $\mathcal{D}(g)$: Need $x+4 \geq 0$

$\mathcal{D}(f) = \{x \mid x \neq -2\}$ $\mathcal{D}(g) = \{x \mid x \geq -4\}$

$\mathcal{D}(f) \cap \mathcal{D}(g)$ = Intersection, "AND" =

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





$\mathcal{D}(f) \cap \mathcal{D}(g) = [-4,-2) \cup (-2,\infty)$

$= \{x \mid -4 \leq x < -2 \text{ OR } -2 < x < \infty\}$

Note: $[-4,-2) \cap (-2,\infty) = \varnothing = \{\}$ = empty set,

$f+g$, $f-g$, fg all have this domain

$f(x) = \frac{x-1}{x+2}$, $g(x) = \sqrt{x+4}$

Find $(f \circ g)(x)$ and its domain.

$$(f \circ g)(x) = f(g(x)) = \frac{g(x)-1}{g(x)+2} = \boxed{\frac{\sqrt{x+4}-1}{\sqrt{x+4}+2}}$$

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

$\mathcal{D}(f) = \{x \mid x \neq -2\}$
$\mathcal{D}(g) = \{x \mid x \geq -4\}$

$$= \{x \mid x \geq -4 \text{ and } \boxed{\sqrt{x+4} \neq -2}\}$$

$$= \boxed{\{x \mid x \geq -4\}}$$

($\sqrt{x+4} \geq 0$ always! $\sqrt{\text{um}} \geq 0$ ..)

$f(x) = \frac{x-1}{x-5}$, $g(x) = \sqrt{x+4}$ is perfect.

Find each of the following and their respective domains.

$\mathcal{D}(f) = \{x \mid x \neq 5\}$

$\mathcal{D}(g) = \{x \mid x \geq -4\}$

(a) $(f+g)(x) = \frac{x-1}{x-5} + \sqrt{x+4}$

$\mathcal{D}(f+g) = \{x \mid x \neq 5 \text{ AND } x \geq -4\} = [-4,5) \cup (5,\infty)$

(b) $(fg)(x) = \left(\frac{x-1}{x-5}\right)\sqrt{x+4}$ Same $\mathcal{D}$ as ↑

Quotient.

(c) $\left(\frac{f}{g}\right)(x) = \frac{\frac{x-1}{x-5}}{\sqrt{x+4}}$ STOP! $= \frac{x-1}{\sqrt{x+4}(x-5)}$

Same $\mathcal{D}$ AND $g(x) \neq 0$, so

$\{x \mid x \neq 5 \text{ AND } x > -4\}$

$= (-4,5) \cup (5,\infty)$

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

$f(x) = \frac{x-1}{x-5}$, $g(x) = \sqrt{x+4}$

$\mathcal{D}(f) = \{x \mid x \neq 5\}$

$\mathcal{D}(g) = \{x \mid x \geq -4\}$

$(f \circ g)(x) = \frac{\sqrt{x+4} - 1}{\sqrt{x+4} - 5}$

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

$= \{x \mid x \geq -4 \text{ and } \sqrt{x+4} \neq 5\}$

Scratch

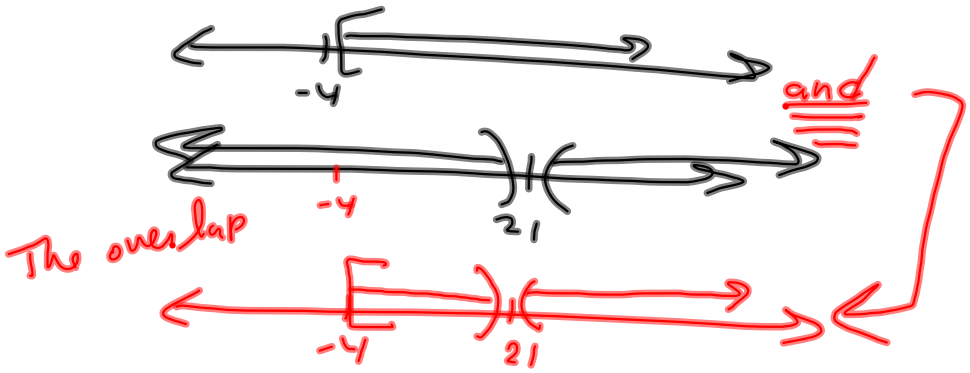
$\sqrt{x+4} = 5$

$x+4 = 5^2 = 25$

$x = 21$

$= \{x \mid x \geq -4 \text{ and } x \neq 21\}$

$= [-4, 21) \cup (21, \infty)$



Homework re-hash for Test 2:

I post solutions.

You look at YOUR WORK and ask me about any discrepancies.

Let $f(x) = \frac{x-1}{x-5}$. Find $f^{-1}(x)$ and find $\mathcal{D}(f)$ and $\mathcal{D}(f^{-1})$ and $\mathcal{R}(f)$ .. $\mathcal{R}(f^{-1})$

$x = \frac{y-1}{y-5}$

left side

$x(y-5) = xy - 5x = y - 1$

$xy - y = 5x - 1$

$y(x-1) = 5x - 1$

$y = \frac{5x-1}{x-1} = f^{-1}(x)$

$\mathcal{D}(f) = \{x \mid x \neq 5\} = \mathcal{R}(f^{-1})$

$\mathcal{D}(f^{-1}) = \{x \mid x \neq 1\} = \mathcal{R}(f)$

$= \{\text{☺} \mid \text{☺} \neq 1\}$