3. Let $f(x)=\sqrt{x-14}$ and $g(x)=x^2-3x-14$

= √stuff

part a (15 pts) What's the domain of $f(x)$? Give the answer in set-builder and interval notation.

part b (15 pts) Determine $(f \circ g)(x)$. Simplify your answer.

f composed with g of x

part c (5 pts) What's the domain of $(f \circ g)(x)$? Give your answer in set-builder and interval notation.

(a) Need stuff ≥ 0

$x-14 \geq 0$

$\{x \mid x \geq 14\}$

= 

$= D = [14, \infty)$

$\mathcal{D}(g) = \mathbb{R} = (-\infty, \infty)$ b/c it's a polynomial

(b) $(f \circ g)(x) = \sqrt{x^2-3x-14-14}$ unsimplified answer.

$= \sqrt{x^2-3x-28}$ simplified.

(c) $\mathcal{D}(f \circ g)$: Formally:

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

$= \{x \mid x \in \mathbb{R} \text{ and } g(x) \geq 14\}$

Informally, look at simplified fog

$\sqrt{x^2-3x-28}$ Need $x^2-3x-28 \geq 0$

Formally: Need $x^2-3x-14 \geq 14$

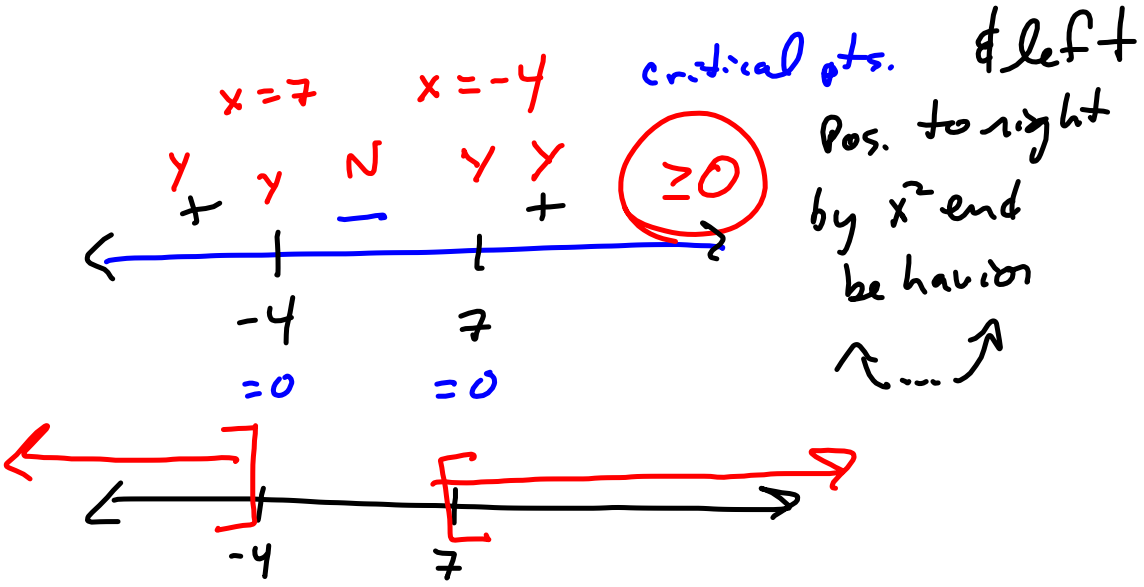
$x^2-3x-28=0$

$(x-7)(x+4)=0$

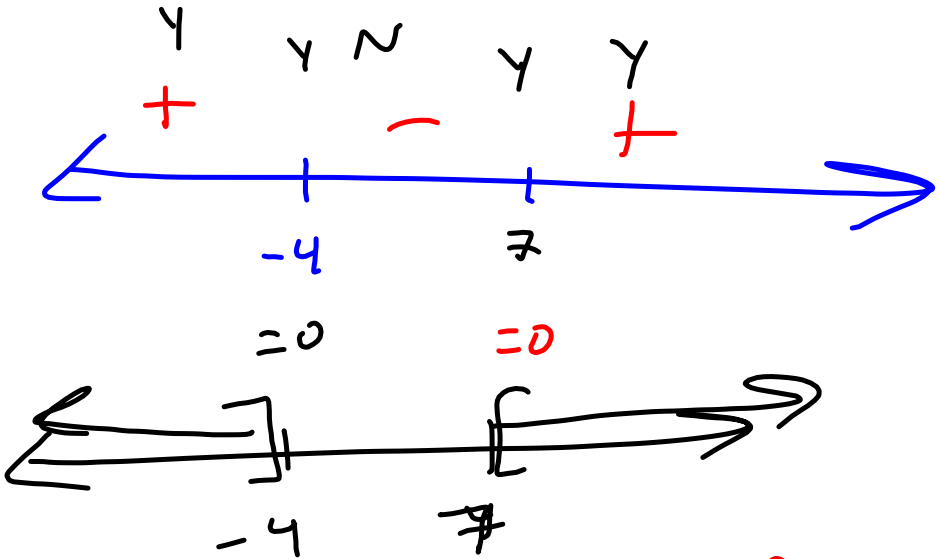
$x-7=0 \quad x+4=0$

$x+4 \geq 0$

$x \geq -4$



$= (-\infty, -4] \cup [7, \infty)$



$= (-\infty, -4] \cup [7, \infty) = D(f \circ g)$

Find Domain.

$$\sqrt{(x-4)(x-3)^2(x+5)(x+7)^3} = f(x)$$

$= \sqrt{\text{stuff}}$ Need stuff ≥ 0

N Y Y Y N Y N Y Y

$- \quad + \quad - \quad - \quad +$ ≥ 0

$-7 \quad -5 \quad 3 \quad 4$

$=0 \quad =0 \quad =0 \quad =0$

$-7 \quad -5 \quad 3 \quad 4$

$= [-7, -5] \cup \{3\} \cup [4, \infty)$

$\log_{11}\left((x-4)(x-3)^2(x+5)(x+7)^3\right) = g(x)$

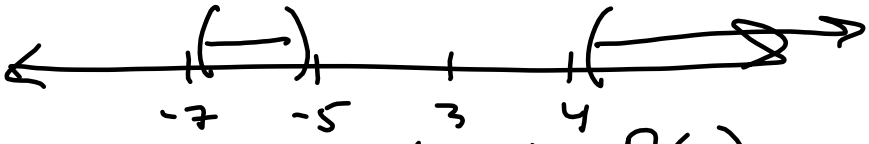
N N Y N N N N N Y

>0

$- \quad + \quad - \quad - \quad +$

$-7 \quad -5 \quad 3 \quad 4$

$=0 \quad =0 \quad =0 \quad =0$



$= (-7,-5) \cup (4,\infty) = D(g)$

RIGHT: $(x)(x)^2(x)(x)^3 = x^7$

$(+)(+)^2(+)(+)^3 = +$

LEFT: $-$ from x^7

$(-)(-)^2(-)(-)^3$

$= (-)(+)(-)(-) = -$