Domain

2 things:

Division by zero is bad.

$\sqrt{\text{negative}}$ is bad.

Otherwise $\mathcal{D} = \mathbb{R}$

$f(x) = \sqrt{x-3}$ $x-3$ negative is bad.

So we

Need $x-3 \geq 0$

$\Rightarrow$ $x \in \{x \mid x \geq 3\}$

$=$ 

$= [3, \infty) = \mathcal{D}(f)$.

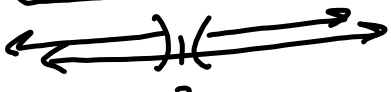
$=$ is

$\Rightarrow$ implies

$g(x) = \dfrac{7x^2+9}{x-3}$ $\quad x-3=0$ is bad

Need: $x-3 \neq 0$

$\Rightarrow$ $D(g) = \{x \mid x \neq 3\}$

$=$ 

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

OR

S'2.4

Let $f(x) = \sqrt{x}$ $\mathcal{D} = \{x \mid x \geq 0\} = [0, \infty)$

$g(x) = x - 4$ $\mathcal{D} = \mathbb{R} = (-\infty, \infty)$

$h(x) = \frac{1}{x-2}$ $\mathcal{D} = \{x \mid x \neq 2\} = (-\infty, 2) \cup (2, \infty)$

$(g \circ h)(x) = g(h(x)) = h(x) - 4$

$g(\boxed{h(x)}) = \boxed{h(x)} - 4$

$= \frac{1}{x-2} - 4$

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

$= \{x \mid x \neq 2 \text{ and } h(x) \in \mathbb{R}\}$

$= \{x \mid x \neq 2\} = (-\infty, \infty) = \mathbb{R}$

$\mathcal{D}(h) = \{x \mid x - 2 \neq 0\}$

$= \{x \mid x \neq 2\} =$

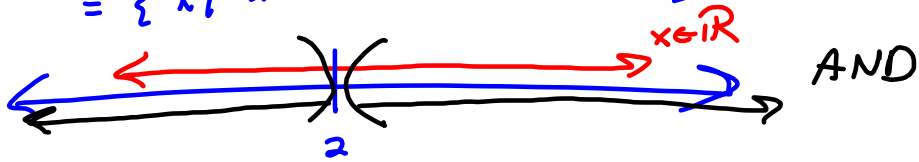
o? Writing Project #2 videos.

$(g \cdot h)(x) = g(x)\, h(x)$ The arithMETic product.

$= (x-4)\left(\frac{1}{x-2}\right)$

$\mathcal{D}(gh) = \{x \mid x \in \mathcal{D}(g) \text{ and } x \in \mathcal{D}(h)\}$

$= \{x \mid x \in \mathbb{R} \text{ and } x \neq 2\}$



$= (-\infty, 2) \cup (2, \infty)$

$f(x) = \sqrt{x+9}$ $g(x) = \frac{1}{x-5}$

$\mathcal{D}(f) = [-9, \infty)$ $\mathcal{D}(g) = (-\infty, 5) \cup (5, \infty)$

Need $x + 9 \geq 0$, $x \geq -9$

Need $x - 5 \neq 0$

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

$= \mathbb{R} \setminus \{5\}$

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

what's $(f \circ g)(x)$

$= f(g(x)) = \sqrt{g(x)} + 9$

$= \sqrt{\frac{1}{x-5} + 9}$

what's $\mathcal{D}(f \circ g)$?

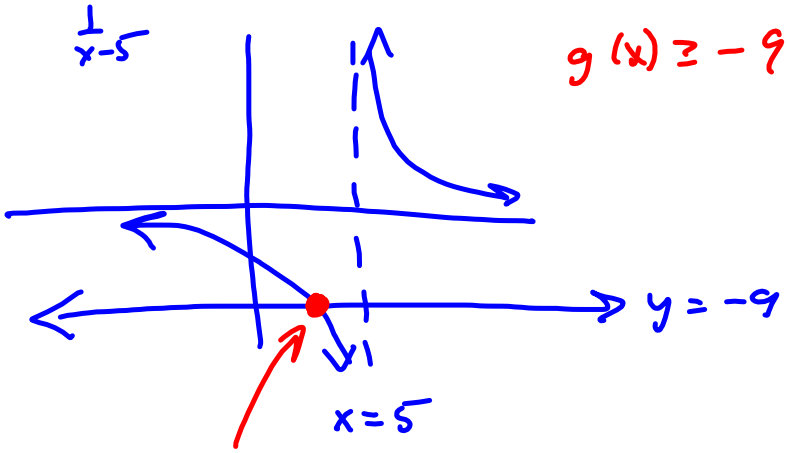
$= \{x \mid x \in \mathcal{D}(g) \text{ and } g(x) \in \mathcal{D}(f)\}$

$= \{x \mid x \neq 5 \text{ and } \frac{1}{x-5} \geq -9\}$

$\frac{1}{x-5} \geq -9$

$x \geq -9$

$g(x) \geq -9$



$\frac{1}{x-5} \geq -9 \Rightarrow 1 \geq -9(x-5)$ IF $x-5 > 0$

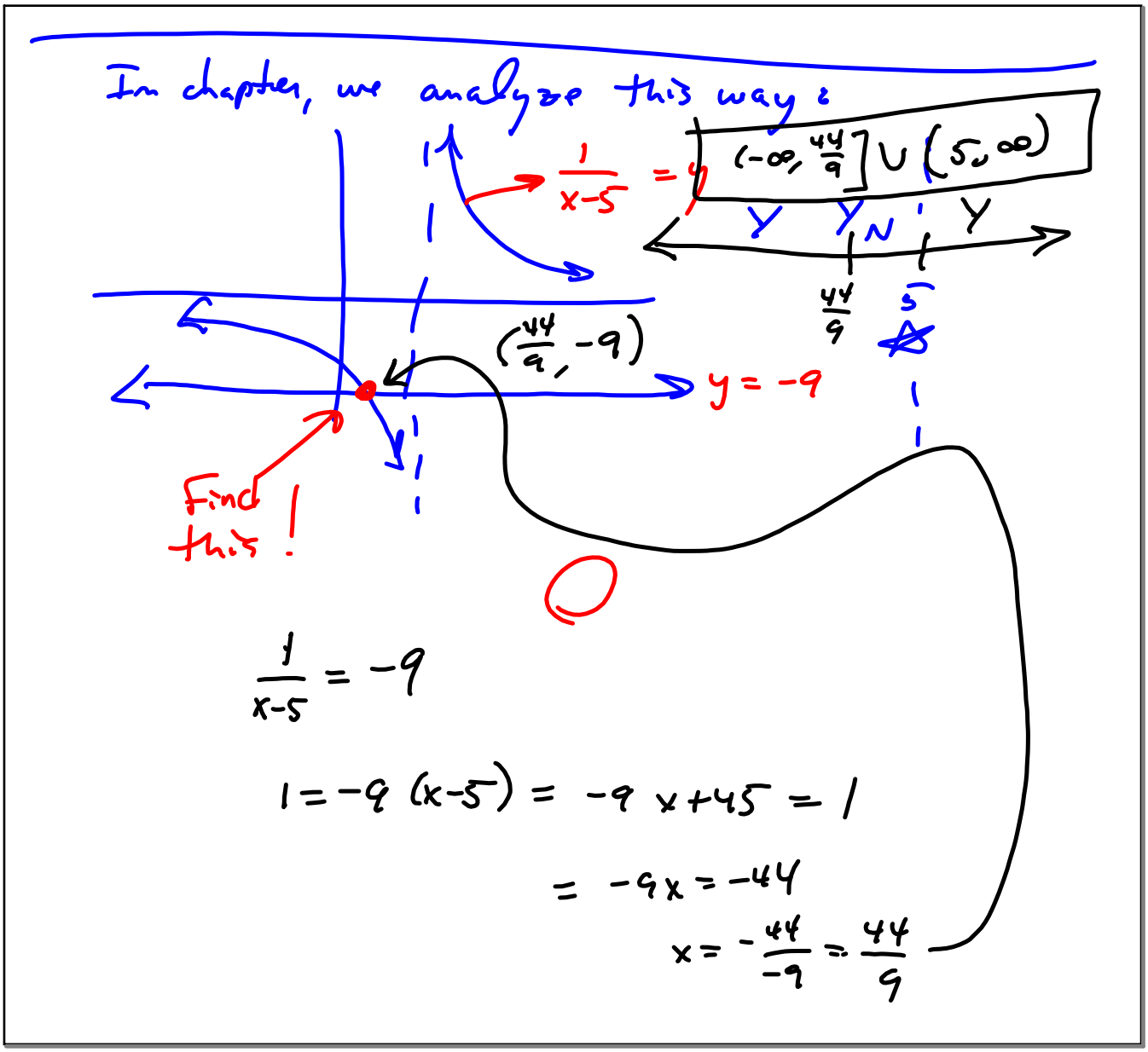
we'll be solving these, later, in a more sophisticated way

Multiplying both sides by x-5 is bad.

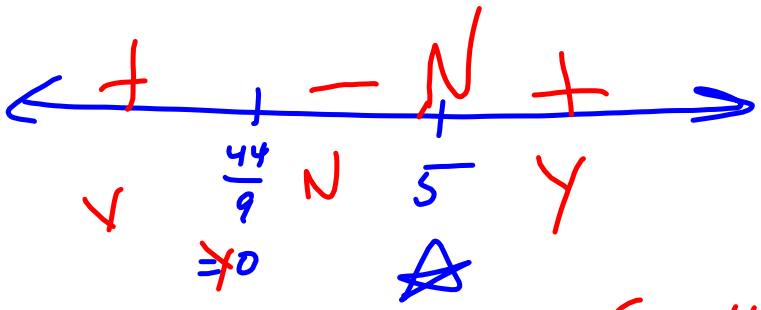
$\frac{1}{x-5} \geq \frac{-9}{1} \cdot \frac{(x-5)}{(x-5)} = \frac{-9x+45}{x-5}$

$\frac{1}{x-5} - \frac{-9x+45}{x-5} = \frac{1}{x+5} + \frac{9x-45}{x-5} = \frac{9x-44}{x-5} \geq 0$

For Chapter 3


In chapter, we analyze this way:
$\frac{1}{x-5} = y$
$(-\infty, \frac{44}{9}] \cup (5, \infty)$
Y Y N Y
$\frac{44}{9}$
5
$(\frac{44}{9}, -9)$
$y = -9$
Find this!
$\frac{1}{x-5} = -9$
$1 = -9(x-5) = -9x + 45 = 1$
$= -9x = -44$
$x = -\frac{44}{-9} = \frac{44}{9}$

$$\frac{9x-44}{x-5} \geq 0$$



$$(-\infty, \tfrac{44}{9}] \cup (5, \infty)$$