

2.1/2.2H Domain of Functions

A. Domain

$\text{dom } f$ all valid inputs

B. Domain Problems

We have problems plugging in numbers into a function if

① We have division by zero

$$\text{EX) } f(x) = \frac{1}{x-2}$$

can't plug in $x=2$!

② We have a negative number under an even root

$$\text{EX) } f(x) = \sqrt[4]{x-3}$$

can't plug in $x=1$! [$\sqrt[4]{-2}$ is non-real complex]

These problems give us the following domain finding recipe:

C. Finding Domain

1. Set all denominators equal to zero to find the bad numbers.
2. Set the inside of all even roots ≥ 0 and solve the inequality.
3. Put your two results together (use AND)

D. Examples

Example 1: Let $f(x) = x^2 + 1$. Find dom f

Solution

1. ✓
2. ✓

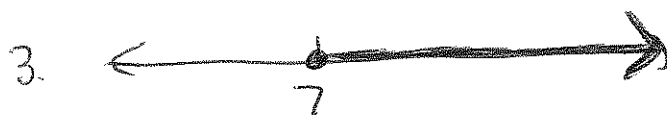
Ans: $\boxed{\text{dom } f = (-\infty, \infty)}$

Example 2: Let $g(x) = \sqrt{x-7}$. Find dom g .

Solution

1. ✓

2. Set inside ≥ 0 : $x-7 \geq 0$
 $x \geq 7$



Ans: $\boxed{[7, \infty)}$

Example 3: Let $h(x) = \frac{x+1}{x+3}$. Find dom h

Solution

1. Set $x+3=0 \Rightarrow x=-3$ BAD NUMBER

2. ✓



Ans: $\boxed{(-\infty, -3) \cup (-3, \infty)}$

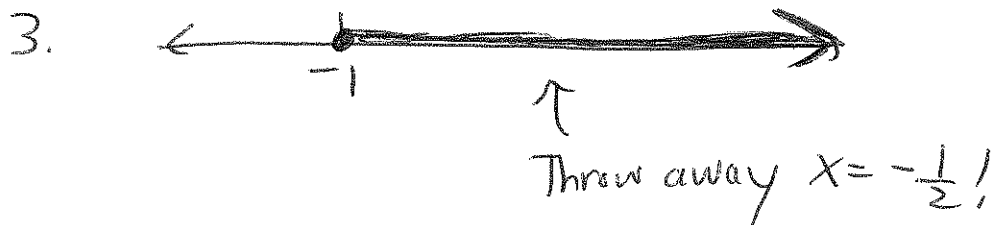
Example 4: Let $f(x) = \frac{\sqrt[4]{x+1}}{2x+1}$. Find dom f .

Solution

1. Denominator: set $2x+1=0 \Rightarrow x = -\frac{1}{2}$ BAD NUMBER

2. Even Root: set inside ≥ 0

$$x+1 \geq 0 \Rightarrow x \geq -1$$



Ans: $\boxed{\text{dom } f = [-1, -\frac{1}{2}) \cup (-\frac{1}{2}, \infty)}$

Example 5: Let $k(x) = \sqrt{\frac{x^2(x-1)}{x+3}}$. Find dom k

Solution

Note: This is different than Example 4: the root is over the whole fraction!

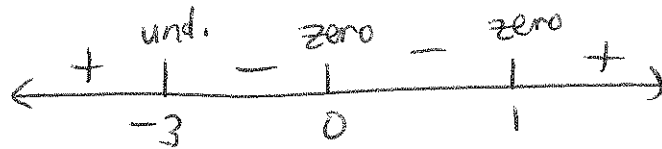
1. Denominator: set $x+3=0 \Rightarrow x = -3$ BAD NUMBER

2. Even Root: set inside ≥ 0

$$\frac{x^2(x-1)}{x+3} \geq 0$$

$$\frac{x^2(x-1)}{x+3} \geq 0 \quad \text{is a rational inequality!}$$

Breakpoints: 0, 1, -3



We want where it is positive or zero.

Ans:

$$\begin{aligned} \text{dom } k &= (-\infty, -3) \cup \{0\} \cup [1, \infty) \\ \text{or} \\ \text{dom } k &= (-\infty, -3) \cup [0, 0] \cup [1, \infty) \end{aligned}$$