

Different Questions to ask ...

Solve $(x+3)^3(x+1)(x-2)^2(x-6) < 0$

using (1) \leftarrow $\begin{matrix} - & + & - & - & + \\ Y & N & Y & N & Y \\ \hline -3 & -1 & 2 & 6 \\ =0 & =0 & =0 & =0 \end{matrix}$ \rightarrow $(-\infty, -3) \cup (-1, 2) \cup (2, 6)$

< 0 $-$

Find sign for one interval, then logic your way ...

(1) $x^3 \cdot x \cdot x^2 \cdot x = x^7$

(2) $x=0: (3)^3(1)(-2)^2(-6) < 0$

using (2) \leftarrow $\begin{matrix} - & + & - & - & + \\ \hline -3 & -1 & 2 & 6 \end{matrix}$ \rightarrow

Solve $(x+3)^3(x+1)(x-2)^2(x-6) \leq 0$

\leftarrow $\begin{matrix} - & + & - & - & + \\ \hline -3 & -1 & 2 & 6 \\ =0 & =0 & =0 & =0 \end{matrix}$ \rightarrow ≤ 0

$(-\infty, -3] \cup [-1, 2] \cup [2, 6]$ is $\frac{7}{10}$
 $= (-\infty, -3] \cup [-1, 6]$ is $\frac{10}{10}$.

Find $\mathcal{D}(f)$: $f(x) = \sqrt{(x+3)^3(x+1)(x-2)^2(x-6)} = \sqrt{g(x)}$

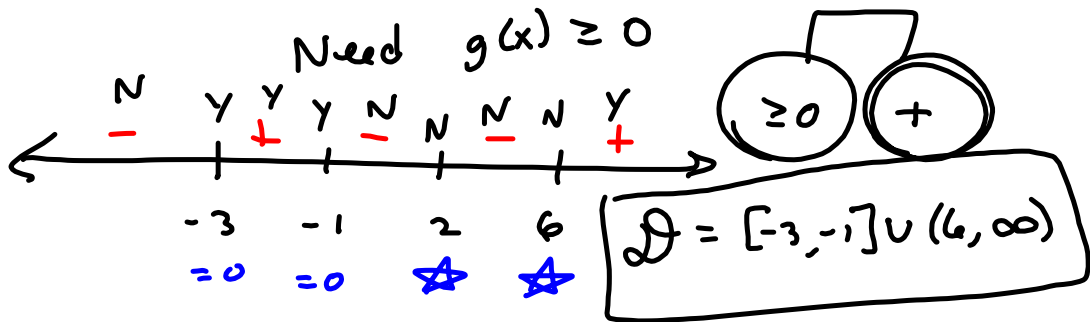
Need $g(x) \geq 0$

\leftarrow $\begin{matrix} - & + & - & - & + \\ \hline -3 & -1 & 2 & 6 \\ =0 & =0 & =0 & =0 \end{matrix}$ \rightarrow ≥ 0 $+$

$[-3, -1] \cup \{2\} \cup [6, \infty)$

$f(x) = \sqrt{\frac{(x+1)(x+3)^3}{(x-2)^2(x-6)}} = \sqrt{g(x)}$ Sign Patterns

Find $\mathcal{D}(f)$: Need $\frac{(x+1)(x+3)^3}{(x-2)^2(x-6)} \geq 0$



① $x \rightarrow \text{Big}$ $\frac{(x)(x)^3}{(x^2)(x)} = \frac{x^4}{x^3} = x' \dots$

Bonus stuff

Anything from previous 2 tests!

$$S' 1.7 \quad |A| < B \quad |A| > B$$

Shared work

Completing the square.

Domain of $\frac{f}{g}$ \cap $f \circ g$

$$\begin{aligned} &\downarrow \\ &2x^2 - x - 3 \\ &(2x-3)(x+1) \end{aligned}$$

$$\begin{aligned} &2x^2 - x - 3 && -3 - 2\left(\frac{1}{16}\right) \\ &= 2\left(x^2 - \frac{1}{2}x\right) - 3 && = -3 - \frac{1}{8} \\ &= 2\left(x^2 - \frac{1}{2}x + \left(\frac{1}{4}\right)^2\right) - 3 - 2\left(\frac{1}{4}\right)^2 && = \frac{-24-1}{8} \\ &&& = -\frac{25}{8} \\ &\frac{\frac{1}{2}}{2} = \frac{1}{4} && \text{vertex } \left(\frac{1}{4}, -\frac{25}{8}\right) \\ &= 2\left(x - \frac{1}{4}\right)^2 - \frac{25}{8} = a(x-h)^2 + k \end{aligned}$$

$$\underline{\underline{\text{Set } 0}} \Rightarrow$$

$$2\left(x - \frac{1}{4}\right)^2 = \frac{25}{8}$$

$$\left(x - \frac{1}{4}\right)^2 = \frac{25}{16}$$

$$x - \frac{1}{4} = \pm \frac{5}{4}$$

$$x = \frac{1 \pm 5}{4}$$

$$\frac{6}{4} = \frac{3}{2}$$

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

$$x \in \left\{-1, \frac{3}{2}\right\}$$

$$f(x) = \frac{x^2 - 6x + 3}{x - 4}$$

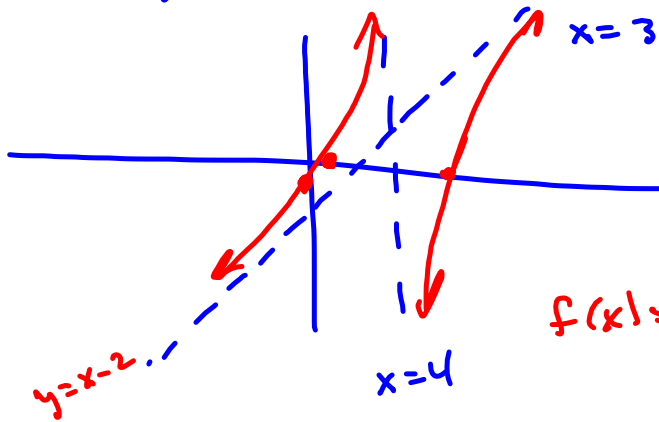
$$\begin{array}{r} 4 \overline{) 1 \quad -6 \quad 3} \\ \underline{4 \quad -8} \\ 1 \quad -2 \quad -5 \\ \underline{4 \quad -8} \\ 1 \quad -5 \end{array}$$

$y = x - 2$

$$\begin{aligned} x^2 - 6x + 3 &= x^2 - 6x + 3^2 + 3 - 3^2 \\ &= (x-3)^2 - 6 \stackrel{\text{set } 0}{} \end{aligned}$$

$$\begin{aligned} (x-3)^2 &= 6 \\ x-3 &= \pm\sqrt{6} \end{aligned}$$

$$x = 3 \pm \sqrt{6}$$



$$(0, -\frac{3}{4})$$

$$f(x) = x - 2 - \frac{5}{x - 4}$$

$$R(x) = \frac{x^2 - 5x - 6}{x^2 - 5x + 6} = \frac{(x+1)(x-6)}{(x-2)(x-3)}$$

$D: \mathbb{R} \setminus \{2, 3\}$

$R(0) = \frac{-6}{6} = -1$

V.A.: $x=2, x=3$

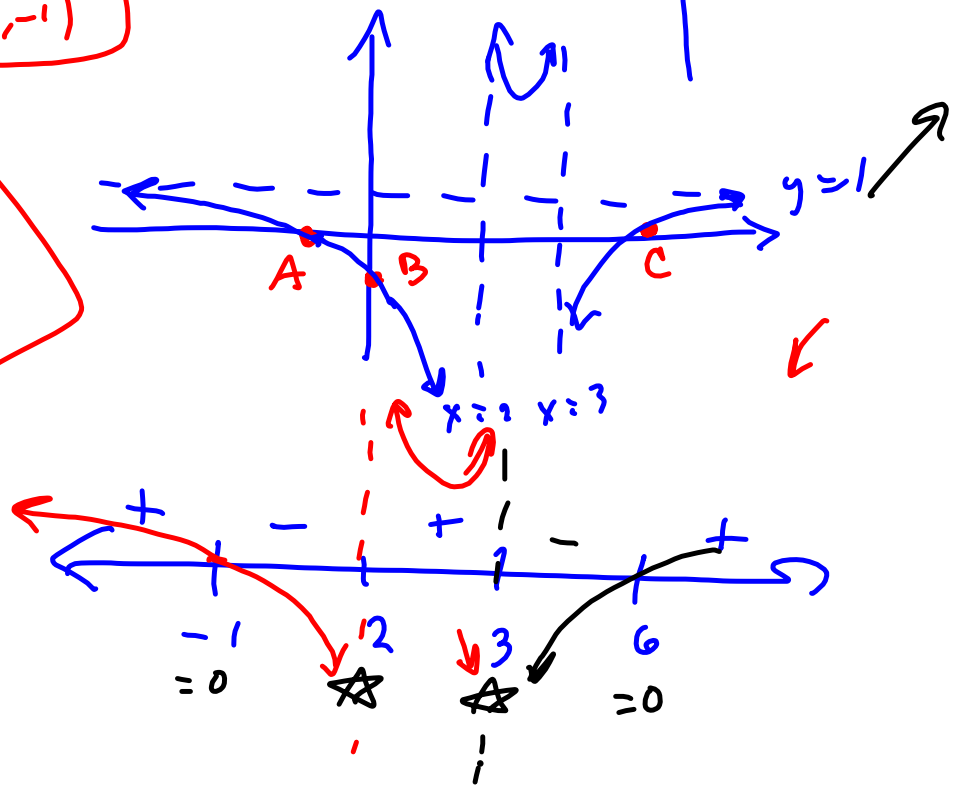
x-Null: $(-1, 0), (6, 0)$

y-Null: $(0, -1)$

End Behavior:

$\frac{x^2}{x^2} = 1 = y$

$A = (-1, 0)$
 $B = (0, -1)$
 $C = (6, 0)$



$$\frac{2x^2 - x - 3}{x^2 + 2x - 15} = \frac{(2x+3)(x+1)}{(x+5)(x-3)}$$

$$R(x) = \frac{x^2 - 5x - 6}{x^2 - 5x + 6} = \frac{(x-6)(x+1)}{(x-2)(x-3)} \cdot \frac{(x-?)}{(x-?)}$$

$$g(x) = \frac{x^3 - 9x^2 + 14x + 24}{x^3 - 9x^2 + 26x - 24} = \frac{(x-6)(x+1)(x-4)}{(x-2)(x-3)(x-4)}$$

$$\begin{array}{r|rrrr} 6 & 1 & -9 & 14 & 24 \\ & & 6 & -18 & -24 \\ \hline -1 & 1 & -3 & -4 & 0 \\ & & -1 & 4 & \\ \hline & 1 & -4 & 0 & \\ & x & c & r & \end{array}$$

$$\begin{aligned} & (x-6)(x^2 - 3x - 4) \\ & = (x-6)(x+1)(x-4) \\ \mathcal{D} & = \mathbb{R} \setminus \{2, 3, 4\} \end{aligned}$$

V.A.: $x=2, x=3$

HOLE (a) $x=4$

where? $R(4) = \frac{(4-6)(4+1)}{(4-2)(4-3)}$

$$= \frac{(-2)(5)}{(2)(1)} = \frac{-10}{2} = -5$$

HOLE = (4, -5)

