① (۳)

$x^2 - ax + b \xrightarrow{\text{ریشه‌ها}} x = 1 , x = 3 \xrightarrow{\text{بسط}}$

$x^2 - ax + b = (x-1)(x-3) \to x^2 - \underline{a}x + \underline{b} = x^2 - \underline{4}x + \underline{3}$

ضرایب : $a = 4$, $b = 3$. $\boxed{a+b = 7}$

② (۴)

$x = -1 \to -1 = 3n \to n = -\frac{1}{3}$

$x = 4 \to 4k - 8 + m - 1 = 0 \to 4k + m - 9 = 0 \to 4k + m = 9$

x		-1		4	
P	$+$	0	$+$	0	$-$

$\frac{5k + m}{k + 4k + 9} - 11 < 0 \to k < 2 \xrightarrow{k \in \mathbb{N}} k = 1 , m = 5$

$\Rightarrow \frac{\frac{5}{1}}{-\frac{1}{3}} = -15 + 1 = \boxed{-14}$

③ (۲)

$-\frac{1}{2}x^2 + 2x + 6 > \frac{7}{2} \to -\frac{1}{2}x^2 + 2x + 6 - \frac{7}{2} > 0 \to$

$\left(-\frac{1}{2}x^2 + 2x + \frac{5}{2} > 0\right)^{\times -2} \to x^2 - 4x - 5 < 0 \to (x-5)(x+1) < 0$

$x = 5$
$x = -1$

		-1		5	
	$+$		$-$		$+$

ج

$(-1, 5) \leftarrow$

$b - a = 5 - (-1) = \boxed{6}$

④ (۳)

$x(x^2-1) - 2(x^2-1) \to (x-1)(x+1)(x-2)$

$1 \quad -1 \quad 2$

	-1		1		2	
$-$	0	$+$	0	$-$	0	$+$

$f(2) = 8 - 12 - 2 + 3 = \boxed{-3}$

$(a, b) = (1, 3)$

نقطه میانی : $\frac{1+3}{2} = 2$

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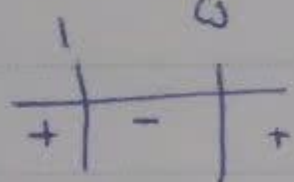
$(a-1)x^2+(a-1)x+1 \xrightarrow{\text{منفی}} \begin{cases} a<0 \to (a-1)<0 \to a<1 & ① \\ \Delta<0 \to b^2-4ac<0 \end{cases}$

$(a-1)^2-4(a-1)(1)<0$

$a^2-6a+5<0$

$(a-1)(a-5)<0$

$a=1,5$



$a\in(1,5)$ ②

$① \cap ② = \varnothing$

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۵ م

$\frac{m(m^3+m)}{m-2}>0$ همواره مثبت

$m-2=0 \to m=2$

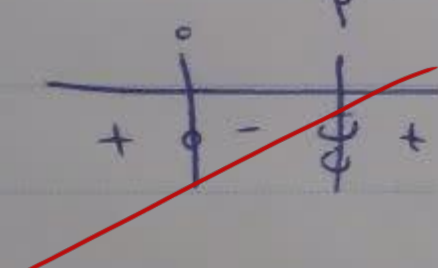
$m(m^3+m)=0 \to m=0$

$m^3+m=0 \to m(m^2+1)=0$

$m=0$

$m^2+1=0 \to m^2=-1$ غ‌ق‌ق

$\frac{m(m(m^2+1))}{m-2}=\frac{m^2(m^2+1)}{m-2}$



$m-2>0$

$m>2$

~~$m\in(-\infty,0]\cup(2,+\infty)$~~

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$\frac{(x^2-x-6)(x-1)^2}{(x^2+x+1)(2-x)^3}\le 0 \to$

$x^2-x-6=0 \to (x+2)(x-3)=0$

$x=-2$

$x=3$

$x-1=0$

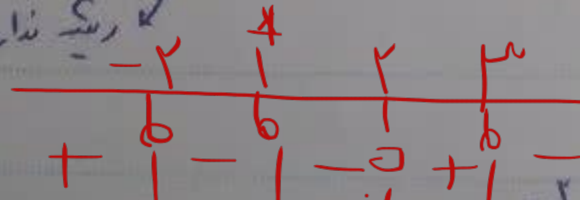
$x=1$

$x^2+x+1=0 \to \Delta<0$

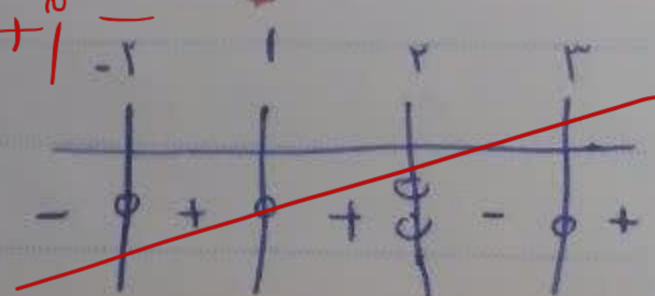
ریشه ندارد ، همواره مثبت

$2-x=0 \to x=2$

$[-2,2)\cup[3,+\infty)$



~~$x\in(-\infty,-2]\cup(2,3]$~~ $\leftarrow$



Arman

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$$\frac{3x^2-2x}{x^2+4} < 2 \rightarrow \frac{3x^2-2x}{x^2+4} - 2 < 0 \rightarrow \frac{3x^2-2x-2x^2-8}{x^2+4} < 0$$

$$\frac{x^2-2x-8}{x^2+4} < 0$$

$x^2-2x-8=0 \rightarrow (x+2)(x-4)=0$

$x=-2,\ x=4$

$x^2+4=0 \rightarrow x^2=-4 \rightarrow \times$

	-2		4	
$+$		$-$		$+$

$\rightarrow x\in(-2,4) \rightarrow b-a = 4-(-2) = \boxed{6}$

۹ ۲

$$-1 < \frac{3x^2-4x}{x+1} < 0 \rightarrow \begin{cases} \dfrac{3x^2-4x}{x+1} < 0 \\ \dfrac{3x^2-4x}{x+1} > -1 \end{cases}$$

$3x^2-4x=0$

$x(3x-4)=0$

$x=0$

$x=\frac{4}{3}$

$x+1=0 \rightarrow x=-1$

	-1		0		$\frac{4}{3}$	
$-$		$+$		$-$		$+$

$(-\infty,-1)\cup(0,\frac{4}{3})$ ①

$$\frac{3x^2-4x}{x+1} > -1 \rightarrow \frac{3x^2-3x+1}{x+1} > 0$$

$3x^2-3x+1=0$

$\Delta<0 \rightarrow$ علامت مثبت

$x+1=0 \rightarrow x=-1$

	-1	
$-$		$+$

$(-1,+\infty)$ ②

① $\cap$ ② $\boxed{(0,\frac{4}{3})}$

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$$\frac{x^2-10}{x} \le 3 \rightarrow \frac{x^2-10-3x}{x} \le 0$$

$x^2-3x-10=0$

$(x+2)(x-5)=0$

$x=-2,5$

$x=0$

	-2		0		5	
$-$		$+$		$-$		$+$

$\rightarrow x\in \boxed{(-\infty,-2]\cup(0,5]}$