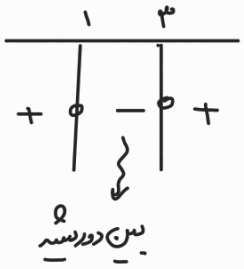
۱-

$(x-3)(x-1)$

$x^2-4x+3 \longrightarrow a=4,\ b=3$

$a+b=4+3=7$



۲-

$(x-3n)^2 \longrightarrow$ ریشه مضاعف $= -1$

$-1-3n=0 \longrightarrow 3n=-1 \longrightarrow n=-\frac{1}{3}$

$((k-2)x+m-1) \longrightarrow$ ریشه $=4 \longrightarrow (k-2)\times 4+m-1=0$

$4k-8-1+m=0$

$m-1=8-4k$

$4(k-2)=1-m$

$k-2=\frac{1-m}{4}$

$k=\frac{1-m}{4}-2=\frac{1-m+8}{4}$

$\frac{m}{n}+k=\frac{m+kn}{n}$

$\frac{m}{n}=\frac{m}{-\frac{1}{3}}=-3m$

$k=\frac{-m-7}{4}-3m=\frac{-m-7-12m}{4}$

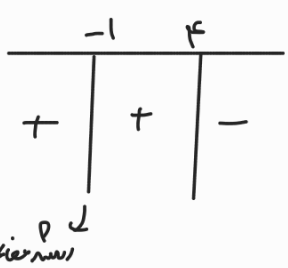
$\frac{9-1}{4} \longrightarrow$ چون مدرج طبیعی است $\longrightarrow m=1$

$k=2 \quad m=1 \quad n=-\frac{1}{3}$

$2k-4\geq 0$

$k\geq 2$

$\frac{m}{n}=2+k \Rightarrow 3n=3$



۳-

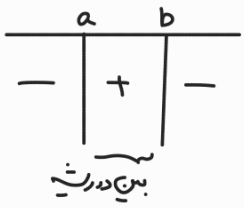
$-\frac{1}{2}x^2+2x+4>\frac{7}{2}$

$-\frac{1}{2}x^2+2x+4-\frac{7}{2}>0$

$-\frac{1}{2}x^2+2x+\frac{5}{2}>0 \xrightarrow{\times -2} x^2-4x-5<0$

$-(x+1)(x-5)$

$-1 \quad 5$



$a=-1,\ b=5$

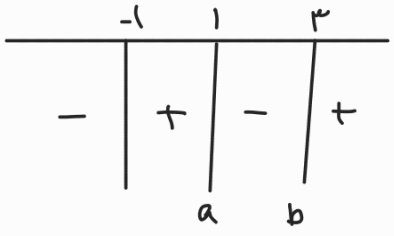
$b-a=5-(-1)=6$

۴ -

$y = x^3 - 3x^2 - x + 1 = (x-1)^3 - 3(x-1)$

$= (x-1)\left((x-1)^2 - 3\right) = (x-1)(x^2+1-2x-3)$

$(x-1)(x^2-2x-3) = (x-1)(x+1)(x-3)$



$a=1 \quad , \quad b=3 \longrightarrow$ نقطه وسطی $= \frac{1+3}{2} = 2$

$f(x) = -4$

---

۵ - به ازای هر مقدار x $\longleftarrow$ $\Delta < 0$

$a-1 < 0 \longrightarrow a < 1$

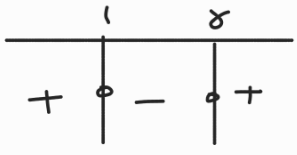
$a \in (0,1)$

$(0,1) \cap (1,+\infty) = \emptyset$

$(a-1)^2 - 3(a-1) < 0$

$a^2+1-2a-3a+3 < 0$

$a^2 - 5a + 4 < 0 \longrightarrow (a-1)(a-4) < 0$



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۶ -

$\frac{m(m^3+m)}{m-2} = \frac{m^2(m^2+1)}{m-2}$ ← همواره مثبت ← همواره مثبت

$m-2 > 0$

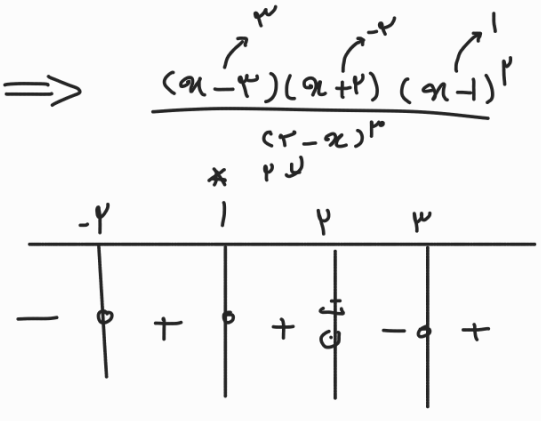
$m > 2$

---

۷ -

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

$\Delta < 0$ ← همواره مثبت



$(-\infty, -2] \cup (2, 3]$

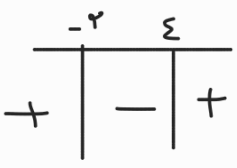
۷-

$$\frac{3x^2-2x}{x^2+4} = \frac{x(3x-2)}{x^2+4} \longrightarrow \frac{x(3x-2)}{x^2+4} < 2$$

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

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

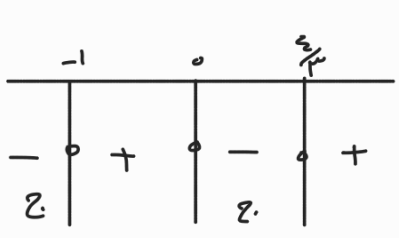
همواره مثبت



$(a,b) = (-2,4)$ $\quad b-a = 4-(-2) = 6$

۹-

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



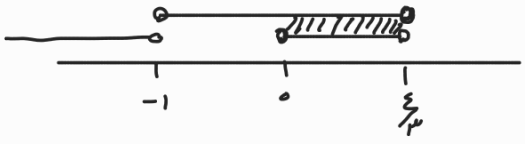
$$-1 < \frac{3x^2-4x}{x+1} \longrightarrow 0 < \frac{3x^2-4x+1+x}{x+1} \longrightarrow \frac{3x^2-3x+1}{x+1} > 0$$

$x+1 > 0$

$x > -1$

$3x^2-3x+1 \longrightarrow \Delta = 9-12 = -3 \longrightarrow \Delta < 0$ ریشه ندارد

همواره مثبت

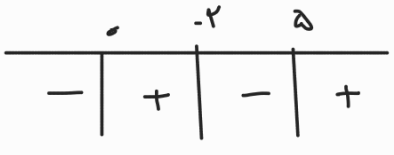


جواب : $(\frac{3}{2}, 0)$

۱۰

$$\frac{x^2-10}{x} \geq 3 \longrightarrow \frac{x^2-10-3x}{x} \leq 0 \longrightarrow \frac{x^2-3x-10}{x} \leq 0$$

$$\frac{(x-5)(x+2)}{x} \leq 0$$



$(-\infty, 0) \cup (-2, 5)$