۱) $x^2 - ax + b$ $+$ 1 2 3 x / $+$ $-$ $+$

$x=1$ $\Rightarrow 1 - a + b = 0$ $\Rightarrow -a + b = -1$

$x=3$ $\Rightarrow 9 - 3a + b = 0$ $\Rightarrow b = 3$

$-2a = -8 \Rightarrow a = 4$ $\quad a + b = 7$

۲) $y = ((k-2)x + m - 1)(x - 3x)^2$ $\quad x - 3x = 0 \Rightarrow -2x = 0 \Rightarrow x = 0$

$y_2 = (k-2)(x-4)(x+1)$ $\quad x = -1 \Rightarrow -3x = 1 \Rightarrow x = -\frac{1}{3}$

x / -1 0 4 / y $+$ $+$ $-$

$x > 4$ باید مثبت شود $\Rightarrow$ چون $k-2$ منفی است منفی می‌شود $\Rightarrow k - 2 < 0 \Rightarrow k < 2$

$k = 1 \Rightarrow$ فقط k می‌تواند 1 باشد

$x = 4 \Rightarrow 4k - 1 + m - 1 = 0$

$k = 1$ $\quad m = 3$

$\frac{m}{n} + k \Rightarrow \frac{3}{-\frac{1}{2}} + 1 = -6 + 1 = -5$

۳) $y = -\frac{1}{2}x^2 + 2x + 4$ $\quad -\frac{1}{2}x^2 + 2x + 4 > \frac{7}{2}$

$(a, b) \Rightarrow (-1, 3)$ $\quad -\frac{1}{2}x^2 + 2x + \frac{1}{2} > 0 \xrightarrow{\times -2} x^2 - 4x - 5 < 0$

$b - a \Rightarrow 3 - (-1) = 4$ $\quad (x-5)(x+1) < 0$

x / -1 5 / $+$ $-$ $+$ $\quad x = -1 \quad x = 5$

۴) $f(x) = x^3 - 2x^2 - x + 3$ $\quad \frac{x^3 - 2x^2 - x + 3}{x - 1} = x^2 - x - 3$

چون ضریب‌ها برابرند پس 1 ریشه است

x / -1 1 3 / $-$ $+$ $-$ $+$

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

$x = 1 \quad x = \sqrt{3} \quad x = -1$

$x > 0 \Rightarrow \sqrt{3} \in (1, 4)$ $\quad \frac{1+3}{2} = 2$

$f(2) = 8 - 12 - 2 + 3 = -3$

۵) $y = (a-1)x^2 + (a-1)x + 1$ $\quad$ همواره منفی $\Rightarrow < 0$

$a > 0 \Rightarrow a - 1 = 0 \Rightarrow a > 1$

$\Delta < 0 \Rightarrow (a-1)^2 - 4(a-1)(1) < 0 \Rightarrow a^2 - 6a + 5 < 0$

$(1, 5) \cap (1, +\infty) = \emptyset$ $\quad (a-5)(a-1) < 0$

a / 1 5 / $+$ $-$ $+$ $\quad a = 1 \quad a = 5$

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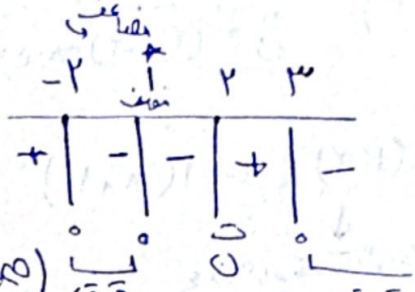
۶) $y = \frac{m(m^3+m)}{m-2} > 0$ $\quad m=0$ $\quad m(m^2+1)$ ← همیشه مثبت

$m=0$ $\quad m=2$

جواب $\Rightarrow (2,+\infty)$

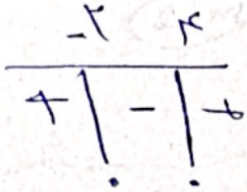
۷) $y = \frac{(x^2-x-6)(x-1)^2}{(x^2+2x+1)(2-x)^3} \leq 0$ $\quad x=1$

$(x-3)(x+2)$ $\quad x=3$ $\quad x=-2$ $\quad x=2$



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

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



$3x^2-2x < 2x^2+8$

$x^2-2x-8 < 0$

$(x+2)(x-4) < 0$

$x=-2 \quad x=4$

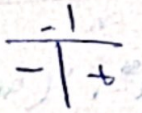
$(-2,4) \Rightarrow \left[2^3-(-2)+1 = 9 \right]$

۹) $-1 < \frac{3x^2-4x}{x+1} < 0$

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

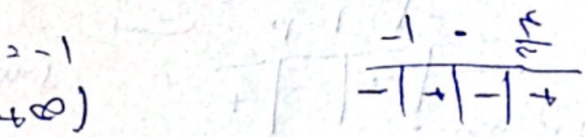
$\frac{3x^2-4x+x+1}{x+1} > 0$ $\quad \frac{3x^2-3x+1}{x+1} > 0$

$\frac{3x^2-5x+1}{x+1} > 0$ $\quad x=-1$



$(-1,+\infty)$

$\frac{3x^2-4x}{x+1} < 0$ $\quad x=0 \quad x=\frac{4}{3}$ $\quad x=-1$

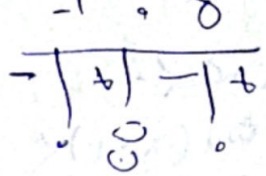


$(-\infty,-1) \cup (0,\frac{4}{3})$

$(0,\frac{4}{3}) \cap (-1,+\infty) = (0,\frac{4}{3})$

۱۰) $y = \frac{x^2-10}{x} \geq 3$ $\quad \frac{x^2-10-3x}{x} \leq 0$

$\frac{(x-5)(x+2)}{x} \geq 0$ $\quad x=5 \quad x=-2 \quad x=0$



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

جواب