-۱

$k(x-1)(x-3) = x^2 - ax + B$ $\begin{cases} a=4 \\ b=3 \end{cases} \Rightarrow a+B=7$

$\Rightarrow k=1 \Rightarrow x^2-4x+3$

1		3	
+	-		+

-۲

x		-1		4	
P	+	0	+		-

$((k-2)x+m-1)(x-3n)^2$

$-1 \rightarrow$ ریشه مضاعف $\rightarrow -1-3n=0 \Rightarrow 3n=-1 \Rightarrow n=-\frac{1}{3}$

$k=1 \Rightarrow (\ominus \leftarrow x>4$ برای$)$

$-x+m-1 \Rightarrow -4+m-1=0 \Rightarrow m=5$

$\frac{m}{n}+k = \frac{5}{-\frac{1}{3}}+1 = -15+1 = -14$

-۳

$-\frac{1}{2}x^2+2x+6 > \frac{7}{2} \Rightarrow -\frac{1}{2}x^2+2x+\frac{5}{2} \xrightarrow{\times -2} x^2-4x-5<0$

$(x-5)(x+1)<0$

	-1		5	
+	0	-	0	+

$\overset{a}{(-1} \quad \overset{b}{5)} \Rightarrow (b-a)_{max} = 5-(-1) = 6$

-۴

$f(x) = x^2(x-3)-(x-3) \Rightarrow (x-3)(x-1)(x+1)$

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

	-1		1		3	
-	0	+	0	-	0	+

$\Rightarrow (1,3)_{max} \Rightarrow \frac{3+1}{2} = 2$

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

-۵

$(a-1)x^2+(a-1)x+1$

① $a-1<0 \Rightarrow a<1$

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

	1		5	
+		-		+

$1 \cap 2 \Rightarrow \emptyset$

$a<a<5$

6-

$$\frac{m(m(m^2+1))}{m-2} = \frac{m^2\overbrace{(m^2+1)}^{\Delta}}{m-2} > 0 \qquad \Delta < 0$$

m		$\overset{0}{*}$		$\overset{2}{\vert}$	
	$-$		$-$		$+$

$3 < m$

7-

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

ل $\Delta < 0 \Leftarrow$ ریشه حقیقی نداره

	$\overset{1}{*}$		$\overset{2}{*}$		$\overset{3}{\vert}$	
$+$		$+$		$+$		$-$

$\Rightarrow \boxed{[3, +\infty)}$

8-

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

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

	$\overset{-2}{\vert}$		$\overset{4}{\vert}$	
$+$		$-$		$+$

$\Rightarrow (-2, 4) \xrightarrow{\Delta < 0} 4-(-2) = 6$

9-

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

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

	$\overset{-1}{\vert}$	
$-$		$+$

$(-1, +\infty)$

$$(2)\ \frac{3x^2-4x}{x+1} < 0 \Rightarrow \frac{x(3x-4)}{x+1} < 0 \Rightarrow$$

	$\overset{-1}{\vert}$		$\overset{0}{\vert}$		$\overset{4/3}{\vert}$	
$-$		$+$		$-$		$+$

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

$1 \cap 2 \Rightarrow (0, \frac{4}{3})$

10-

$$\frac{x^2-10}{x} \leqslant 3 \rightarrow \frac{x^2-3x-10}{x} \leqslant 0 \longrightarrow \frac{(x-5)(x+2)}{x} \leqslant 0$$

x		$\overset{-2}{\vert}$		$\overset{0}{\vert}$		$\overset{5}{\vert}$	
	$-$		$+$		$-$		$+$

$\Rightarrow x = (-\infty, 2] \cup (0, 5]$