

$x^2 - ax + b$
 $1 - a + b = 0 \rightarrow 1 = a - b \rightarrow \begin{cases} 1 = a - b \\ 9 = 9a - b \end{cases} \rightarrow \begin{cases} 1 = a - b \\ 4 = 8a \end{cases} \rightarrow \begin{cases} 1 = a - b \\ a = 2 \end{cases} \rightarrow \begin{cases} 1 = 2 - b \\ b = 1 \end{cases}$

$9 - 9a + b = 0 \rightarrow 9 = 9a - b \rightarrow \begin{cases} 1 = a - b \\ 9 = 9a - b \end{cases} \rightarrow \begin{cases} 1 = a - b \\ 4 = 8a \end{cases} \rightarrow \begin{cases} 1 = a - b \\ a = 2 \end{cases} \rightarrow \begin{cases} 1 = 2 - b \\ b = 1 \end{cases}$

$4 = 8a \rightarrow b = 1$
 $1 = a - 2 \rightarrow a = 3$

$a + b = 3 + 1 = 4$

$\begin{array}{c} 1 \quad 1 \\ + \quad - \\ \hline 1 \quad 1 \end{array}$

$y = ((k-2)x + m-1)(x-2n)^2 \rightarrow n = -\frac{1}{2}$

$-1 - 2n = 0$
 $-1 = 2n \rightarrow n = -\frac{1}{2}$

$\begin{array}{c} x \\ \hline P \end{array} \begin{array}{c} -1 \\ + \\ 0 \\ + \\ 2 \\ - \end{array}$

$(k-2)x + m-1$
 $k-1+m-1=0$
 $k+m-2=0$
 $m=2-k$

$\frac{m}{n} + k \rightarrow \frac{2-k}{-1/2} + k \rightarrow -2(2-k) + k \rightarrow -4 + 2k + k \rightarrow 3k - 4$

$g = ((k-2)x + (2-k) - 1)(x+1)^2$
 $g = ((k-2)x + 1 - k)(x+1)^2$
 $g = (kx - 2x + 1 - k)(x+1)^2$
 $(k(x-2) - 1(x-k))(x+1)^2$

$\Rightarrow g = (k-2)(x-1)(x+1)^2$
 $(x-1) > 0, (x+1) > 0 \rightarrow x > 1$
 $x < -1$
 $k-2 < 0 \rightarrow k < 2$
 $k=1$

$y = -\frac{1}{2}x^2 + 2x + 6 > \frac{1}{2}$

$-\frac{1}{2}x^2 + 2x + 6 > \frac{1}{2}$
 $-\frac{1}{2}x^2 + 2x + 5 > 0$
 $-\lambda^2 + 4\lambda + 10 > 0$
 $-\lambda^2 + 4\lambda + 10 > 0$
 $-\lambda^2 + 4\lambda + 10 > 0$

$\begin{array}{c} -1 \quad 10 \\ - \quad + \\ \hline -1 \quad 10 \end{array} \rightarrow (-1, 10)$
 $b-a \rightarrow 10 - (-1) = 11$

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

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

$\begin{array}{c} -1 \quad 1 \quad 3 \\ + \quad - \quad - \\ \hline -1 \quad 1 \quad 3 \end{array}$

$(-\infty, -1) \cup (1, 3) \rightarrow (1, 3) \rightarrow \frac{1+3}{2} = 2$

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

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

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

$a < 0 \rightarrow a-1 < 0 \rightarrow a < 1$

$\begin{array}{c} 1 \quad 5 \\ + \quad - \\ \hline 1 \quad 5 \end{array}$

$\begin{array}{c} 1 \quad 5 \\ \hline 1 \quad 5 \end{array}$

$\frac{m^2(m^2+m)}{m-2} > 0$

$\begin{array}{c} m^2 \quad m \\ + \quad + \\ \hline m^2 \quad m \end{array}$

$\begin{array}{c} 2 \\ - \\ \hline 2 \end{array}$

$(2, +\infty)$

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

$\begin{array}{c} -2 \quad 1 \quad 1 \\ + \quad - \quad - \\ \hline -2 \quad 1 \quad 1 \end{array}$

$(-2, 2) \cup (2, +\infty)$

$f(x) = \frac{3x^2 - 2x}{x^2 + 4} = 2 \rightarrow 3x^2 - 2x = 2(x^2 + 4) \rightarrow 3x^2 - 2x = 2x^2 + 8 \rightarrow x^2 - 2x - 8 = 0$

$\Delta = (-2)^2 - 4(1)(-8) = 4 + 32 = 36$

$\frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow \frac{2 \pm 6}{2} \rightarrow \frac{2+6}{2} = 4, \frac{2-6}{2} = -2$

$\begin{array}{c} -2 \quad 4 \\ + \quad - \\ \hline -2 \quad 4 \end{array}$

$y = 2$ در بازه $(-2, 4)$
 $(a, b) \rightarrow b - a \rightarrow 4 - (-2) = 6$

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

$\Delta = b^2 - 4ac = 16 - 4(3)(1) = 4$

$\frac{-b \pm \sqrt{\Delta}}{2a} \rightarrow \frac{4 \pm 2}{6} \rightarrow \frac{4+2}{6} = 1, \frac{4-2}{6} = \frac{1}{3}$

$\begin{array}{c} 1 \quad 1/3 \\ + \quad - \\ \hline 1 \quad 1/3 \end{array}$

$(0, \frac{1}{3})$

$$\frac{x^r - 1}{x} \leq r \rightarrow \frac{x^r - 1}{r} - r \leq 0 \rightarrow \frac{x^r - (1 + 2r)}{r} \leq 0 \rightarrow \frac{(x+r)(x-a)}{r} \leq 0 \rightarrow \frac{-r}{r+r+r} \rightarrow (-\infty, -r] \cup (0, a]$$

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