

$$x^2 - ax + b \quad \begin{array}{r|rr} x & 1 & a \\ y & + & - \end{array}$$

$$1 - a + b = 0 \rightarrow -a + b = 1 \quad (1)$$

$$a - b = 1$$

$$\begin{array}{l} a - b = 1 \\ -a + b = 0 \\ \hline -a = -1 \rightarrow a = 1 \end{array}$$

$$\begin{array}{l} a - b = 1 \\ b = 0 \\ \hline a = 1 \end{array}$$

$$9 - 4a + b = 0 \rightarrow -4a + b = -9$$

$$x^2 - 4x + 9 \quad \begin{array}{r|rr} x & 1 & 4 \\ y & + & - \end{array}$$

$$a + b = 4 \quad (2)$$

$$y = ((x-1)(x+m-1))(x-4)^2$$

$$(x-4)^2 \rightarrow -4x = 1 \rightarrow \boxed{m = -\frac{1}{4}}$$

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

$$(x-1)(x+m-1) = 0 \rightarrow x + m - 1 = 0 \rightarrow x + m = 1$$

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

$$x^2 - 4x + 4 > 0$$

$$\begin{array}{l} (-1, 4) \quad b = 4 \\ (4, 4) \rightarrow a = -4 \end{array}$$

$$x^2 - 4x - 4 < 0$$

$$(x+1)(x-4) < 0$$

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

$$\begin{array}{r|rr} x & -1 & 4 \\ y & + & - \end{array}$$

(3)

$$\frac{x(m^2 + m)}{m} > 0 \rightarrow m(m^2 + 1) = 0 \rightarrow m = 0 \checkmark$$

$$m^2 + 1 = 0 \rightarrow m^2 = -1 \text{ (no real solution)}$$

$$\begin{array}{r|rr} x & 0 & 1 \\ y & - & + \end{array}$$

$$\boxed{m > 0}$$

(6)

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

$$\boxed{-2 < x < 4 \quad \cup \quad x > 4}$$

$$\begin{array}{r|rr} x & -2 & 4 \\ y & + & - \end{array}$$

$$f(n) = \frac{r n^2 - r n}{n^2 + 1} \quad f(n) < r \quad (8)$$

$$\frac{r n^2 - r n}{n^2 + 1} < r \rightarrow r n^2 - r n < r n^2 + r \rightarrow r n^2 - r n - r < 0$$

$$a = -r \quad (-r, r) \leftarrow$$

$$b = r \quad (a, b)$$

$$\frac{n}{5} \mid \begin{array}{c} -r \quad r \\ + \phi - \phi + \end{array}$$

$$(n+r)(n-r) < 0$$

$$\delta = (-r) = \boxed{r}$$

$$\frac{n}{5} \mid \begin{array}{c} -1 \quad 0 \quad \frac{r}{r} \\ -\phi + \phi - \phi + \end{array}$$

$$\frac{n(rn - r)}{n^2 + 1} < 0 \leftarrow$$

$$-1 < \frac{r n^2 - r n}{n^2 + 1} < 0 \quad (9)$$

$$\cup \rightarrow f(n) > -1 \rightarrow \boxed{0 < n < \frac{r}{r}} \rightarrow \boxed{(0, \frac{r}{r})}$$

$$\frac{n^2 - 1}{n} \leq w \rightarrow n^2 - 1 \leq w n \rightarrow n^2 - 1 - w n \leq 0 \quad (10)$$

$$(n+r)(n-w) \leq 0$$

$$n \neq 0$$

$$1 \cup 2 \rightarrow \boxed{-r \leq n < 0 \cup 0 < n < w}$$

$$(2 - r \leq n \leq w)$$

$$\frac{n}{5} \mid \begin{array}{c} -r \quad w \\ + \phi - \phi + \end{array}$$

$$(a-1)n^2 + (a-1)n + 1 < 0$$

$$a < 0 \rightarrow a < 1 \quad (2)$$

$$\Delta < 0 \rightarrow b^2 - 4ac < 0$$

$$a = (r - \sqrt{r}, r + \sqrt{r})$$

$$\frac{n}{5} \mid \begin{array}{c} r - \sqrt{r} \quad r + \sqrt{r} \\ + \phi - \phi + \end{array}$$

$$a^2 - 4a + 1 < 0 \rightarrow \frac{a}{2} = \frac{r \pm \sqrt{r}}{2}$$

$$\textcircled{1} \cup \textcircled{2} \rightarrow \boxed{(r - \sqrt{r}, 1)}$$