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$$f(x) = x^r + (m-r)x^r + a^r = 0 \rightarrow x^r (1 + (m-r)) = 0 \rightarrow x^r (m-r+1) = 0 \quad (1)$$

$$\rightarrow \sqrt{4x^r + (m+r)x + \frac{m}{r}} = 0 \rightarrow 4x^r + (m+r)x + \frac{m}{r} = 0 \rightarrow 4x^r + (m+r)x + \frac{m}{r} = 0$$

$$\frac{\sqrt{4x^r + (m+r)x + \frac{m}{r}}}{|x^r + \frac{1}{r}|} = \frac{\sqrt{\frac{m}{r}} |x+1|}{|x^r - \frac{1}{r} + \frac{1}{r}|} \rightarrow \frac{\sqrt{\frac{m}{r}}}{|x^r - \frac{1}{r} + \frac{1}{r}|} = \frac{r \tan b}{\sqrt{x}} \rightarrow \frac{\sqrt{\frac{m}{r}}}{\frac{r}{r}} = \frac{r \tan b}{\sqrt{\frac{1}{r}}} \rightarrow \tan b = \frac{\sqrt{r}}{r} \rightarrow b = \frac{\pi}{4}$$

$$f(x) = \frac{x^r + ax + b}{x-1} \xrightarrow{x=1} 1+a+b=0 \rightarrow a+b=-1 \quad (2)$$

$$\omega x^r - ax + b = 0 \rightarrow \omega - a + b = 0 \rightarrow a - b = \omega$$

$$\left[\frac{b-r\omega}{r} \right] = \left[-\frac{r}{r} \right] = \boxed{-1} \quad \checkmark$$

$$\frac{|(x+r)(x-1)|}{a(1-x)} \rightarrow \frac{r}{1-x} \xrightarrow{x=1} -\frac{r}{a} = b \left(\frac{1}{1-x} \right) \rightarrow -\frac{r}{r} = 1 \cdot b \rightarrow b = -\frac{r}{r_0} \quad (3)$$

$$\rightarrow \frac{(x+r)(x-1)}{a(1-x)} = -\frac{x+r}{a} \xrightarrow{x=1} \tan \frac{\pi}{4} = -\frac{r}{a} \rightarrow a = r$$

$$ab = r \times \left(-\frac{r}{r_0} \right) = \boxed{-r} \quad \checkmark$$

$$f(x) = a[x+1] + b[x+[x+1]] \rightarrow f(x) = a[x] + a + b[x] + b[a] + b \quad (4)$$

$$f(a) = a[a] + a + b[a] + b[a] + b \rightarrow \left. \begin{array}{l} \lim_{x \rightarrow 0^+} a + b[a] + b = k \\ \lim_{x \rightarrow 0^-} -a + a - b + b[a] + b = k \end{array} \right\} \rightarrow a + b + b[a] = k[a]$$

$$a[a] + a - [a[a] - a] = -a[a] \rightarrow \frac{a[a]}{f(a)} = \frac{a[a]}{-a[a]} = \boxed{-1} \quad \checkmark$$

$$f(x) = b[x^r - ax] - ra \xrightarrow{x=a} b[a^r - a^2] - ra = 0 \rightarrow b = 0 \rightarrow f(x) = -ra \quad (5)$$

$$\frac{a}{f(b)} = \frac{a}{-ra} = \boxed{-\frac{1}{r}} \quad \checkmark$$

$$f(x) \xrightarrow{x=a} (x-a) \rightarrow f(ra) = 0 \rightarrow (x-ra) \rightarrow \dots \quad (6)$$

$$\frac{(x-a)(x-ra)}{-(x-a)} = -(x-ra) \xrightarrow{x=a} -(a-ra) = r \rightarrow a = r$$

$$(m-a)(n-ra) = x^r - ran + ra^r = x^r + mx + m \rightarrow m = -ra \rightarrow m = -r \rightarrow n-m = \boxed{1} \quad \checkmark$$

