

$$r^r = r^{rA+B} \Rightarrow r = r^{A+B}$$

$$r^r = r^{A+B} \xrightarrow{r \neq 1} 0 = A+B \Rightarrow \begin{cases} rA+B=r \\ -A-B=0 \end{cases}$$

$$\frac{rA+B=r}{rA=A} \Rightarrow A=1 \Rightarrow B=-1 \Rightarrow f(x) = r^{x-1}$$

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$$\Rightarrow f(0) = r^{0-1} = \frac{1}{r}$$

$$r^{x+r} = r^{x+15} \Rightarrow r^x \times r = (r^x)^r + 15 \xrightarrow{\div r^x} r^x - 1 + 15 = 0 \Rightarrow (r^x - 3)(r^x - 5) = 0$$

$$\Rightarrow \begin{cases} r^x = 5 \Rightarrow r^x = 5 \Rightarrow x = \log_r 5 \\ r^x = 3 \Rightarrow r^x = 3 \Rightarrow x = \log_r 3 \end{cases} \Rightarrow x_1 + x_2 = \log_r 5 + \log_r 3 = \log_r 15$$

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$$\left( \log_{r1}^r = \frac{1}{\log_{r1}^r} = \frac{1}{1 + \log_r^r} \quad \Bigg/ \quad \log_{r1}^r = \frac{1}{\log_{r1}^r} = \frac{1}{1 + \log_r^r} = \frac{1}{1 + \frac{1}{\log_r^r}} = \frac{1}{\frac{\log_r^r + 1}{\log_r^r}} = \frac{\log_r^r}{1 + \log_r^r} \right) //$$

$$(\log_{r1}^r)^r + \log_{r1}^{r \times r} \times \log_{r1}^{r \times r} = (\log_{r1}^r)^r + (1 + \log_r^r)(r + \log_r^r) \xrightarrow{\div \log_r^r}$$

$$\frac{r^r}{(r+1)^r} + \left(1 + \frac{1}{1+r}\right) \left(r + \frac{1}{1+r}\right) = \frac{r^r}{(r+1)^r} + \left(\frac{r+1}{r+1}\right) \left(\frac{r+1}{r+1}\right) = \frac{r^r + r^2 + r + 1}{r^2 + r + 1}$$

$$= \frac{r^r + r^2 + r + 1}{r^2 + r + 1} = \frac{r^r + r^2 + r + 1}{r^2 + r + 1} = \boxed{r}$$

3

$$\log(x-1)^r + \log(1-x)^r = \log 10 \xrightarrow{(x-1)^r = (1-x)^r} \log^{(1-x)^r(1-x)^r} = \log 10$$

$$\Rightarrow (1-x)^{2r} = 10 \Rightarrow 1-x = 10 \Rightarrow x = -9 \Rightarrow \log_r^{(-9)} = \log_r^9 = \boxed{2}$$

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$$\log_r^{(x^2 + 2x + 1)(x-2)} = \log_r^1 \Rightarrow (x^2 + 2x + 1)(x-2) = 1 \Rightarrow x^3 - 1 = 1 \Rightarrow x^3 = 14 \Rightarrow x = \sqrt[3]{14}$$

$$\log_{r^{\sqrt[3]{14}}} = \log_r^1 = \boxed{\frac{1}{3}}$$

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$$\log \frac{r-x}{(x-y)^r} = \log 10^r \implies (r-x)^r = 10^r$$

$$\implies r-x=10 \implies x=-1$$

$$\log^{-x} \sqrt{r} = \log^{-(-1)} \sqrt{r} = \log^1 \sqrt{r} = \log^{\frac{r}{r}} \sqrt{r} = \frac{r}{r} \log^{\frac{r}{r}} \sqrt{r} = \boxed{\frac{r}{r}}$$

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$$r^{x^r-r} = r^{fx} \implies x^r-r=fx \implies x^r-fx-r=0 \implies \Delta=14+1=15$$

$$\implies \begin{cases} x_1 = \frac{r\sqrt{r}+f}{r} = \sqrt{r}+r & \text{و } \bar{0} \\ x_2 = \frac{-r\sqrt{r}+f}{r} = -\sqrt{r}+r & \text{و } \bar{0} \end{cases} \quad (\log^{\frac{r}{r}} = \log^{\frac{r}{r}} - \lambda \bar{0} \bar{0})$$

$$\log^{\frac{r}{r}} \sqrt{r} = \log^{\frac{r}{r}} \sqrt{r} = \boxed{\frac{1}{r}}$$

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$$\log^1 \sqrt{r} = \log^{\frac{r}{r}} \sqrt{r} = r \log^{\frac{r}{r}} \sqrt{r} = \frac{r}{\log^{\frac{r}{r}} \sqrt{r}} = \frac{r}{\log^{\frac{r}{r}} \sqrt{r} + \log^{\frac{r}{r}} \sqrt{r}} = \frac{r}{1+r \log^{\frac{r}{r}} \sqrt{r}} = \frac{r}{1+r \times \frac{\Delta}{r}} = \frac{r}{1+\Delta}$$

$$= \boxed{\frac{r}{1+\Delta}}$$

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$$\log^{\frac{r}{r}} \sqrt{r} = \frac{1}{\log^{\frac{r}{r}} \sqrt{r}} = \frac{1}{\log^{\frac{r}{r}} \sqrt{r} + \log^{\frac{r}{r}} \sqrt{r}} = \frac{1}{1 + \frac{1}{\log^{\frac{r}{r}} \sqrt{r}}} = \frac{1}{1 + \frac{1}{\log^{\frac{r}{r}} \sqrt{r} + \log^{\frac{r}{r}} \sqrt{r}}} = \frac{1}{1 + \frac{1}{1 + \frac{\Delta}{r}}}$$

$$= \frac{1}{1 + \frac{1}{\frac{r}{\Delta}}} = \frac{1}{1 + \frac{\Delta}{r}} = \frac{1}{\frac{r+\Delta}{r}} = \boxed{\frac{r}{r+\Delta}}$$

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$$\log^{\frac{r}{r}} \sqrt{r} = \frac{1}{r} \log^{\frac{r}{r}} \sqrt{r} = \frac{1}{10} \implies \log^{\frac{r}{r}} \sqrt{r} = \frac{1}{10}$$

$$(a \log^{\frac{r}{r}}) x^r + a x + b \log^{\frac{r}{r}} = 0 \implies x^r + \frac{x}{\log^{\frac{r}{r}}} + \frac{b}{a} = 0 \implies 1 - \frac{1}{\log^{\frac{r}{r}}} + \frac{b}{a} = 0$$

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$$\implies \frac{b}{a} = \frac{1}{\log^{\frac{r}{r}}} - 1 = \log^{\frac{10}{r}} - 1 = \log^{\frac{10}{r}} - \log^{\frac{r}{r}} = \log^{\frac{10}{r}}$$

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$$(\sqrt{r})^{\frac{b}{a}} = (\sqrt{r})^{\log^{\frac{10}{r}}} = \Delta^{\log^{\frac{r}{r}}} = \Delta^{\frac{1}{r}} = \boxed{\sqrt{\Delta}}$$