

$$f(x^r + x) = r x^r - 1$$

$$f(r) + f(10) = ? \rightarrow \begin{cases} x^r + x = r \rightarrow x = 1 \xrightarrow{r x^r - 1} r(1)^r - 1 = 1 \\ x^r + x = 1 \rightarrow x = r \xrightarrow{r x^r - 1} r(r)^r - 1 = \checkmark \end{cases}$$

$$\Rightarrow \begin{cases} f(r) = 1 \\ f(10) = r \end{cases} \rightarrow f(r) + f(10) = 1 + r = \boxed{\wedge}$$

$$f(x) = x^r - 4x^r + 12x \rightarrow f(x) = x^r - 4x^r + 12x = (x-r)^r + 1$$

$$g(x) = x^r + 9x^r + 2\sqrt{x} \rightarrow g(x) = x^r + 9x^r + 2\sqrt{x} = (x+r)^r - 2\sqrt{x}$$

$$\frac{g(\sqrt[3]{r} - r)}{f(\sqrt[3]{r} + r)} \Rightarrow \begin{cases} g(\sqrt[3]{r} - r) = (\sqrt[3]{r} - r + r)^r - 2\sqrt[3]{r} = r - 2\sqrt[3]{r} = -2 \\ f(\sqrt[3]{r} + r) = (\sqrt[3]{r} + r - r)^r + 1 = r + 1 = 10 \end{cases}$$

$$\hookrightarrow \frac{g(\sqrt[3]{r} - r)}{f(\sqrt[3]{r} + r)} = \frac{-2}{10} = \boxed{-\frac{1}{5}}$$

$$f(x) = \sqrt{x + \sqrt{x - r}}$$

$$g(x) = \sqrt{x - \sqrt{x - r}}$$

$$f(x) + g(x) = a + b\sqrt{x + c}$$

$$\frac{a+b}{c} = ?$$

$$\Rightarrow a + b\sqrt{x + c} = d + b\sqrt{x + c} = r \Rightarrow \sqrt{x + c} = \sqrt{x + c} \xrightarrow{\text{وإذا}} |a + c| = |b + c|$$

$$\Rightarrow \begin{cases} a + c = -b - c \\ -b - c = a + c \end{cases} \rightarrow r c = 1 \rightarrow \boxed{c = \frac{1}{r}}$$

$$f(x) = \frac{x+r}{x^r - r x + r} \rightarrow f(x) = \frac{x+r}{(x-1)(x-r)} \Rightarrow D_f = \mathbb{R} - \{1, r\}$$

$$g(x) = \left\{ \left(\frac{r}{r}, 1 \right), \left(\frac{1}{1}, 0 \right), \left(\frac{r}{r}, 0 \right), \left(\frac{0}{0}, r \right) \right\}$$

$$g/f = ? \rightarrow D_f \cap D_g = \{r, 0\}$$

$$\hookrightarrow g/f = \left\{ \left(r, -\frac{1}{r} \right), \left(0, \frac{r}{r} \right) \right\} \Rightarrow \boxed{g/f = \left\{ \left(r, -\frac{1}{r} \right), \left(0, 1 \right) \right\}}$$

$$f(x) = \left\{ \left(\frac{1}{1}, r \right), \left(\frac{r}{r}, -1 \right), \left(\frac{r}{r}, r \right), \left(\frac{-1}{-1}, r \right) \right\}$$

$$g(x) = \left\{ \left(-\frac{r}{r}, r \right), \left(\frac{1}{1}, -1 \right), \left(\frac{r}{r}, r \right), \left(\frac{-1}{-1}, 0 \right) \right\}$$

$$a) f(rx) \rightarrow \text{دالة مركبة} \rightarrow f(rx) = \left\{ \left(\frac{1}{r}, r \right), \left(\frac{r}{r}, -1 \right), \left(\frac{r}{r}, r \right), \left(\frac{-1}{-r}, r \right) \right\}$$

$$b) f(x^r) \rightarrow \text{دالة مركبة} \rightarrow f(x^r) = \left\{ \left(1, r \right), \left(\sqrt{r}, -1 \right), \left(r, r \right), \left(\sqrt{-1}, r \right), \left(-1, r \right), \left(\sqrt{r}, -1 \right), \left(-r, r \right) \right\}$$

$$c) r g^r(x) + 1 \rightarrow r g^r(x) + 1 = \left\{ \left(-r, r(r^r + 1) \right), \left(1, r(-1)^r + 1 \right), \left(r, r(r^r + 1) \right), \left(-1, r(0)^r + 1 \right) \right\}$$

$$d) r f/g \rightarrow D_{f/g} = \{ \pm 1, r \}$$

$$\Rightarrow r f/g = \left\{ \left(-1, \frac{r(r)}{-1} \right), \left(1, \frac{r(r)}{-1} \right), \left(r, \frac{r(-1)}{r} \right) \right\} = \left\{ \left(-1, -r \right), \left(1, -r \right), \left(r, -1 \right) \right\} = \boxed{r f/g}$$