

$$\frac{(n-1)^2 - n^2}{n(n-1)} \geq 0 \rightarrow \frac{n^2 + 1 - 2n - n^2}{n(n-1)} \geq 0 \rightarrow \frac{1-2n}{n(n-1)} \geq 0 \rightarrow \frac{1}{n} - \frac{2}{n-1} \geq 0$$

$$D_f = (-\infty, 0) \cup [2, 1)$$

$$\Rightarrow \frac{3}{n-1} + \frac{1}{n+2} = \frac{3(n+2) + n-1}{(n-1)(n+2)} = \frac{4n+5}{(n-1)(n+2)} \neq 0 \rightarrow 4n+5 \neq 0 \rightarrow n \neq -\frac{5}{4}$$

$$n+1 \neq 0 \rightarrow n \neq -1 \quad n-1 \neq 0 \rightarrow n \neq 1 \quad n+2 \neq 0 \rightarrow n \neq -2 \quad D_f = \mathbb{R} - \left\{-\frac{5}{4}, -1, -2, 1\right\}$$

$$\Rightarrow \left(\frac{1}{x}\right)^n - 9 = 0 \rightarrow \left(\frac{1}{x}\right)^n = 9 \rightarrow n = -2 \quad 2^{\frac{1}{2}} = 2^{\frac{1}{2}n} \rightarrow x = \frac{\Delta}{2} \quad \frac{-2}{2} = -1$$

$$D_f = (-\infty, -2] \cup \left[\frac{\Delta}{2}, +\infty\right)$$

$$\Rightarrow x-1 \geq 0 \rightarrow x \geq 1$$

$$\sqrt{y+1} = 2 - \sqrt{x-1} \rightarrow 2 - \sqrt{x-1} \geq 0 \rightarrow \sqrt{x-1} \leq 2 \rightarrow -1 \leq x-1 \leq 4 \rightarrow 0 \leq x \leq 5$$

$$D_f = [1, 5]$$

$$x^2 - x - 2 = (x-2)(x+1) \geq 0 \rightarrow \begin{array}{c} -1 \quad 2 \\ + \quad - \quad + \end{array} \quad x < -1 \quad x > 2 \quad \textcircled{1}$$

$$\sqrt{x^2 - 1} + 1 \neq 0 \quad \checkmark$$

$$x^2 - 1 \geq 0 \rightarrow x^2 \geq 1 \rightarrow x \geq 1 \quad \vee \quad x \leq -1 \quad \textcircled{2}$$

$$D_f = (-\infty, -1) \cup (2, +\infty)$$

1 in 2

$$y = \sqrt{-(n^2 - an - 3)} \quad n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{a \pm \sqrt{a^2 - 4(-3)}}{2} = -2 \rightarrow \frac{a \pm \sqrt{a^2 + 12}}{2} = -2$$

$$a \pm \sqrt{a^2 + 12} = -4 \rightarrow \pm \sqrt{a^2 + 12} = -a - 4 \rightarrow \sqrt{a^2 + 12} = -a - 4 \rightarrow a^2 + 12 = a^2 + 8a + 16 \rightarrow 8a = -4 \rightarrow a = -\frac{1}{2}$$

$$n = \frac{-\frac{1}{2} \pm \sqrt{\frac{1}{4} + 12}}{2} \rightarrow \frac{-\frac{1}{2} \pm \sqrt{\frac{49}{4}}}{2} = \frac{-\frac{1}{2} \pm \frac{7}{2}}{2} = \frac{3}{2} = b$$

$$a + b = \frac{3}{2} - \frac{1}{2} = 1$$

$$x \geq 1 \rightarrow 3x - 2 = x \rightarrow 2x = 2 \rightarrow x = 1$$

$$x < 1 \rightarrow 2x + 3 = x \rightarrow x = -3$$

$$D_g = [-3, +\infty)$$

$$\begin{array}{c} -3 \quad 1 \\ - \quad + \quad + \end{array} \quad x \leq 2 \rightarrow 3(2) - 2 = 4 \rightarrow 4 - 2 > 0$$

$$x = 0 \rightarrow 2(0) + 3 = 3 \rightarrow 3 - 0 > 0$$

$$x = -\frac{1}{2} \rightarrow 2\left(-\frac{1}{2}\right) + 3 = -1 + 3 = 2 \rightarrow -1 + 3 > 0$$

$r(a+1) \left(\frac{a+1}{r} \right) = ra + r(-r) + a \rightarrow 1 \leq (a+1) \leq a-r \rightarrow 1 \leq a+1 \leq a-r$ $\rightarrow 1 \cdot a = -11 \rightarrow \boxed{a = -11}$	6
$(r-\sqrt{r})(r+\sqrt{r}) = 1 \rightarrow f(n) + f\left(\frac{1}{n}\right) = \sqrt{n} + \frac{1}{\sqrt{n}} + r + \frac{1}{\sqrt{n}} + \sqrt{n} + r =$ $r\left(\sqrt{n} + \frac{1}{\sqrt{n}}\right) + r \rightarrow f(r-\sqrt{r}) + f(r+\sqrt{r}) = r\left(\sqrt{r+\sqrt{r}} + \frac{1}{\sqrt{r+\sqrt{r}}}\right) + r$ $\frac{1}{\sqrt{r+\sqrt{r}}} \times \frac{\sqrt{r-\sqrt{r}}}{\sqrt{r-\sqrt{r}}} = \sqrt{r-\sqrt{r}} \rightarrow (\sqrt{r+\sqrt{r}} + \sqrt{r-\sqrt{r}})^r = A^r$ $A^r = r + \sqrt{r} + r - \sqrt{r} + r\sqrt{r-r} \rightarrow A^r = 9 \rightarrow A = \sqrt{9} \Rightarrow \boxed{r\sqrt{9} + r}$	7
$rf(n) - rf(-n) = rn^r - n \xrightarrow{\times r} rf(n) - rf(-n) = 12n^r - 2n$ $rf(-n) - rf(n) = rn^r + n \xrightarrow{\times r} rf(-n) - rf(n) = 12n^r + 2n$ $-\Delta f(n) = rn^r + n \rightarrow \boxed{f(n) = \frac{rn^r + n}{-\Delta}}$	8
$n \Rightarrow -r \rightarrow (r+r)f(-r) - r(-r)f(-r+r) = r(-r)^r + r_m + r_m - 1$ $\rightarrow 9f(0) = 12 + 12m \rightarrow 9f(0) = 12 + \frac{4\Delta}{r} \rightarrow f(0) = \frac{V\Delta}{r} \times \frac{1}{4} = \boxed{\frac{V\Delta}{12}}$ $n = 0 \rightarrow rf(0) - r(0)f(0+r) = r(0)^r - m(0) + r_m - 1$ $\rightarrow rf(0) = r_m - 1 \xrightarrow{\times r} 9f(0) = 9m - r$ $9m - r = 12 + 12m \rightarrow r_m = 11 \rightarrow \boxed{m = \frac{11}{r} = \frac{9}{r}}$	9
$f(an) = an + b \rightarrow an + b + \frac{a}{n} + b = \frac{rn^r - 12n + r}{n} \rightarrow \frac{an^r + rb n + 9}{n} = rn^r - 12n + r$ $f\left(\frac{1}{n}\right) = \frac{a}{n} + b$ $a = r$ $rb = -12 \rightarrow b = -4$ $\rightarrow f(n) = rn - 4 \rightarrow f(-1) = r(-1) - 4 = \boxed{-9}$	10