

الف) $\frac{x^2 - 2x + 1 - x^2}{x(x-1)} = \frac{1-2x}{x(x-1)} > 0 \rightarrow \frac{1}{x} - \frac{2}{x-1} > 0 \rightarrow D_f = (-\infty, 0) \cup [\frac{1}{2}, 1)$

ب) $\frac{x-2x-2}{x(x+1)} = \frac{-x-2}{x(x+1)}$
 $\frac{2x+4+x-1}{(x-1)(x+2)} = \frac{3x+3}{(x-1)(x+2)}$
 $x \neq \{-2, -1, 0, 1\}$
 $3x+3 \neq 0 \Rightarrow x \neq -1$
 $D_f = \mathbb{R} - \{-2, -\frac{5}{2}, -1, 0, 1\}$

الف) $\left(\frac{1}{2}\right)^n - 9 > 0 \Rightarrow \left(\frac{1}{2}\right)^n > 9 \Rightarrow D_f = \mathbb{R} - (-2, 2/5)$

ب) $\sqrt{y+1} = 3 - \sqrt{x-1} \Rightarrow \sqrt{x-1} \geq 0 \Rightarrow x \geq 1$
 $\sqrt{x-1} \leq 3 \Rightarrow x-1 \leq 9 \Rightarrow x \leq 10$
 $D_f = [1, 10]$

$x^2 - x - 2 < (x+1)/(x-2) > 0 \rightarrow (-\infty, -1) \cup (2, +\infty)$
 $x^2 - 1 > 0 \Rightarrow (x-1)/(x+1) > 0 \rightarrow \mathbb{R} - (1, -1)$
 $D_f = (-\infty, -1) \cup (2, +\infty)$

$-(x^2 - 9x - 3) = -(x+2)/(x-b) \Rightarrow -2b - 3 \Rightarrow b = 1/5$
 $2-b = -a = 2-1/5 = 9/5 \Rightarrow a = -9/5$
 $a+b = -8/5$

$f(x) = x \Rightarrow \begin{cases} 2x-2 > 1 \Rightarrow 2/(x-1) > 0 \Rightarrow x \geq 1 \\ x+3 < 1 \Rightarrow x+3 > 0 \Rightarrow x > -3 \end{cases} \Rightarrow D_f = [-3, +\infty)$

$f\left(\frac{\sqrt{x}}{2} + \frac{1}{2}\right) = f\left(\frac{\sqrt{x+1}}{2}\right) = \frac{1}{2} \left(\frac{\sqrt{x+1}}{2} + \frac{1}{2} \right) = \frac{\sqrt{x+1}}{4} + \frac{1}{4}$

$f\left(\frac{a+1}{a-1}\right) = \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1} = \frac{\frac{a+1+a-1}{a-1}}{\frac{a+1-a+1}{a-1}} = \frac{2a}{2} = a$
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$f(g(a)) \xrightarrow{g(a)=t} t - ft = -f \Rightarrow t - ft + f = 0 \Rightarrow t = 2 \Rightarrow \sqrt{a^2 - 1} = 2$
 $a^2 - 1 = 4 \Rightarrow a^2 = 5 \Rightarrow a = \pm\sqrt{5}$

$f(\cos x + 2 \cos x - 3/5) = 0 \Rightarrow \cos^2 x + 2 \cos x - 14/5 = 0$
 $\frac{1}{5} \sqrt{1 - \tan^2 x} = \frac{3}{5} - f(x)$
 $\cos x = \frac{1}{5} \sqrt{1 - \tan^2 x}$

۱۵) $f(1+3) = f(4) = 1-4+6 = 3$
 $f(-2) = f(-2+2) = 3+3+6 = 12$

الف) $\frac{x^2 - 2x + 1 - x^2}{x(n-1)} = \frac{1-2x}{x(n-1)} > 0 \Rightarrow \frac{0}{+} \frac{1}{-} \frac{1}{+} \frac{1}{-} \Rightarrow D_f = (-\infty, 0) \cup [\frac{1}{2}, 1)$

ب) $\frac{x-2x-2}{x(n+1)} \cdot \frac{2x+4+x-1}{(n-1)(n+2)} \rightarrow \begin{cases} x \neq \{-2, -1, 0, 1\} \\ x+2 \neq 0 \Rightarrow x \neq -2 \end{cases} \Rightarrow D_f = \mathbb{R} - \{-2, -\frac{5}{2}, -1, 0, 1\}$

الف) $\left(\left(\frac{1}{x}\right)^n - 9\right) \left(22 - \frac{1}{x}\right) > 0 \Rightarrow \frac{-2}{+} \frac{2/\Delta}{-} \Rightarrow D_f = \mathbb{R} - (-2, 2/\Delta)$

ب) $\sqrt{y+1} = 2 - \sqrt{x-1} \Rightarrow \begin{cases} \sqrt{x-1} > 0 \Rightarrow x > 1 \\ \sqrt{x-1} \leq 2 \Rightarrow x-1 \leq 4 \Rightarrow x \leq 5 \end{cases} \Rightarrow D_f = [1, 5]$

$x^2 - x - 2 = (x+1)/(x-2) > 0 \Rightarrow (-\infty, -1) \cup (2, +\infty) \Rightarrow D_f = (-\infty, -1) \cup (2, +\infty)$

$x^2 - 1 > 0 \Rightarrow (x-1)/(x+1) > 0 \Rightarrow \mathbb{R} - (1, -1)$

$-(x^2 - ax - 3) = -(x+2)/(x-b) \Rightarrow \begin{cases} -2/b < -3 \Rightarrow b < 1/\Delta \\ 2-b = -a = -2.1/\Delta < -a \Rightarrow a < -0.1/\Delta \end{cases} \Rightarrow a+b < 1$

$f(x) = x \Rightarrow \begin{cases} 2x-2 > 0 \Rightarrow x > 1 \Rightarrow 2/(x-1) > 0 \Rightarrow x > 1 \\ x+3 < 0 \Rightarrow x < -3 \Rightarrow x+3 > 0 \Rightarrow x > -3 \end{cases} \Rightarrow D_f = [-3, +\infty)$

$f\left(\frac{\sqrt{x}}{2} + \frac{1}{2}\right), f\left(\frac{\sqrt{x}+1}{2}\right) = \frac{1}{2} \left(\frac{\Delta + \sqrt{\Delta}}{2}\right) = \frac{\sqrt{\Delta}-1}{2} = \frac{\Delta+1}{2} = \frac{1}{2} \Rightarrow \Delta = 1$

$f\left(\frac{a+1}{a-1}\right) = \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1} = \frac{\frac{a+1+a-1}{a-1}}{\frac{a+1-a+1}{a-1}} = \frac{2a}{2} = a \Rightarrow a \in \mathbb{R} - \{1\}$

$f(g(x)) \xrightarrow{g(x)=t} t - t^2 = -t \Rightarrow t - t^2 + t = 0 \Rightarrow t = 2 \Rightarrow \sqrt{x^2 - 1} = 2$

$a^2 - 1 = 4 \Rightarrow a^2 = 5 \Rightarrow a = \pm \sqrt{5}$

$\cos^2 x + \Delta \cos x - 3/\Delta = 0 \Rightarrow \cos^2 x + \Delta \cos x - 1$
 $\cos x = \frac{1}{\Delta} \checkmark \Rightarrow \tan x = 3 = f(1/\Delta)$
 $\cos x = \frac{1}{\Delta} < -1 \times$

110 $\begin{cases} f(1+3) = f(4) = 1 - \Delta + 9 = 2 \\ f(-2) = f(-2+3) = 37 + 30 + 9 = 69 \end{cases} \Rightarrow 2 \times 69 = 138$

$$f(n) = r^n - \varepsilon n = r^n - \varepsilon n + r - r = r(n^r - r n + 1) - r = r(n-1)^r - r \quad \underline{4}$$

$$\sin \frac{\pi}{r} + c.s.r.n = \sqrt{\frac{r}{r}} + 1 \rightarrow f\left(\sqrt{\frac{r}{r}} + 1\right) = r\left(\sqrt{\frac{r}{r}} + 1 - 1\right)^r - r = r\left(\frac{r}{\varepsilon}\right) - r = -\frac{1}{r}$$