

الف) $\frac{(x-1)^2 - x^2}{x(x-1)} \geq 0$

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

این تابع همواره تعریف شده است. به نقاطی که خارج از مخرج ها صفر می شوند $D_f: \mathbb{R} - \{0, -1, 1\}$

الف) $(\frac{1}{x})^2 \geq 9 \rightarrow x \leq -\frac{1}{3}$ $x^2 \leq 9 \rightarrow x \in [-3, 3]$ $\frac{-2}{+} \frac{1}{-} \frac{1}{+}$
 $D_f: (-\infty, -\frac{1}{3}] \cup [\frac{1}{3}, +\infty)$

ب) ① $x-1 \geq 0 \rightarrow x \geq 1$
 ② $\sqrt{x-1} \leq 3 \rightarrow x-1 \leq 9 \rightarrow x \leq 10 \rightarrow D_f: [1, 10]$

① $(x-2)(x+1) > 0 \rightarrow x > 2 \vee x < -1$ $\frac{-1}{+} \frac{2}{-}$ $\text{①} \cap \text{②} \rightarrow D_f: (-\infty, -1) \cup (2, +\infty)$
 ② $x^2 - 1 \geq 0 \rightarrow x^2 \geq 1 \rightarrow x \geq 1 \vee x \leq -1$

بلی از $\frac{b}{a}$ ها بیاوریم $\rightarrow$ حاصل ضرب $\rightarrow -2x \leq \frac{3}{-1} \rightarrow b \leq \frac{3}{2}$
 -2 و دیگری b ها $\rightarrow$ جمع $\rightarrow -2+b = \frac{-9}{-1} \leq -2+b \leq a \rightarrow a \in [7, \infty)$
 $a+b \in (-1, \infty) + (1, \infty) \subset \mathbb{R}$

$f(x) - x \geq 0$

① $x \geq 1 \rightarrow 3x - 2 - x \geq 0 \rightarrow 2x \geq 2 \rightarrow x \geq 1 \cap x \geq 1 \rightarrow x \geq 1$
 ② $x < 1 \rightarrow 2x + 3 - x \geq 0 \rightarrow x + 3 \geq 0 \rightarrow x \geq -3 \cap x < 1 \rightarrow -3 \leq x < 1$
 ① $\cup$ ② $\rightarrow [-3, +\infty)$

$\sin \frac{x}{\sqrt{2}} \in \frac{\sqrt{2}}{2}, \cos 2x \in 1$

$f(\frac{\sqrt{2}}{2} + 1) \leq 2(\frac{\sqrt{2}+2}{2})^2 \leq (\frac{\sqrt{2}+2}{2})$
 $\hookrightarrow 2(\frac{2+\sqrt{2}}{2}) - 2\sqrt{2} - 2 = 2 + \sqrt{2} - 2\sqrt{2} - 2 = -\sqrt{2}$

$f(x) \in \frac{x+1}{x-1}$
 $f(f(a)) = f(\frac{a+1}{a-1}) = \frac{\frac{a+1}{a-1} + 1}{\frac{a+1}{a-1} - 1} = \frac{a+1+a-1}{a+1-a+1} = \frac{2a}{2} = a \rightarrow$ به ازای هر a ها
 که در دایره تعریف شده باشد برقرار است

$f(g(a)) = -2 \rightarrow g(a)^2 - 4g(a) = -2 \rightarrow y^2 - 4y + 2 = 0 \rightarrow (y-2)^2 = 0$
 $\rightarrow y = 2 \rightarrow \sqrt{a^2 - 1} = 2 \rightarrow a^2 - 1 = 4 \rightarrow a^2 = 5 \rightarrow a = \pm \sqrt{5}$
 $g(a) = 2$

$$\begin{aligned} f(F) &\in f(1+\omega) = 1-\omega+4 < 1 \\ f(-\omega) &\in f(-4+\omega) = \omega^2 + \omega_0 + 4 \in V \\ f(-\omega) \times f(F) &= V \times V = 1 \times 1 \end{aligned}$$

$$\begin{aligned} F \cos^2 \alpha + \omega \cos \alpha - \omega &\rightarrow F \cos^2 \alpha + \omega \cos \alpha - \omega, \omega < 0 \rightarrow F \alpha^2 + \omega \alpha - \omega, \omega < 0 \\ \xrightarrow{\text{جواب}} \alpha^2 + \omega \alpha - 1 &= 0 \rightarrow (\alpha + \omega)(\alpha - 1) = 0 \rightarrow \alpha = \frac{-\omega}{F} \leq \alpha = \frac{1}{F} < 0, \omega \\ &\downarrow \quad \quad \quad \downarrow \\ &-1, \omega \quad \quad \cos \alpha < 0, \omega \\ &\quad \quad \quad \alpha = 90^\circ \end{aligned}$$

$-1 \leq \cos \alpha \leq 1$
 في $\alpha = -1, \omega < 0$

$$f(\omega, \alpha) \in (\tan 90^\circ)^2 \in (\sqrt{\omega})^2 = \omega$$