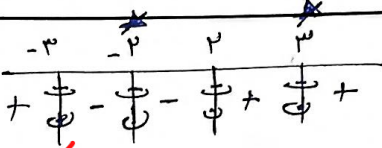
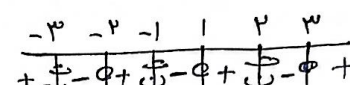


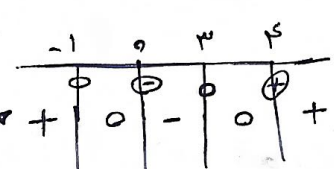
الف) $\frac{(a_1-3)(a_1+2)}{(a_1-2)(a_1+2)(a_1-3)(a_1+3)}$  6

$D_f = (-\infty, 2) \cup (2, 3) \cup (3, +\infty)$ ✓

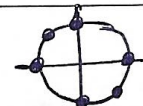
ب) $\frac{(a_1-1)(a_1-3)(a_1+2)}{(a_1+1)(a_1+3)(a_1-2)}$  6

$D_f = (-\infty, -3) \cup [-2, -1) \cup [1, 2) \cup [3, +\infty)$ ✓

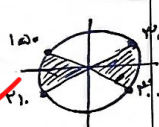
الف) $[-a_1] - 2 \geq 0 \rightarrow [-a_1] \geq 2 \rightarrow -a_1 \geq 2 \rightarrow a_1 \leq -2 \rightarrow D_f = (-\infty, -2]$ ✓

ب) $\frac{\omega a_1^2 + 9}{([a_1] - 3)([a_1] + 1)}$  6

$\Rightarrow D_f = (-\infty, -1) \cup [0, 3) \cup [5, +\infty)$ ✓

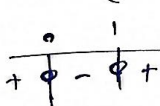
الف) $C + a_1 \rightarrow a_1 \neq k\pi$
 $\tan a_1 \rightarrow a_1 \neq k\pi + \frac{\pi}{2}$
 $\tan a_1 + 1 \neq 0 \Rightarrow \tan a_1 \neq -1 \Rightarrow a_1 \neq k\pi - \frac{\pi}{4}$  6

$D_f = \mathbb{R} - \left\{ \frac{k\pi}{4}, k\pi - \frac{\pi}{4} \right\}$ ✓

ب) $1 - \sqrt[3]{\sin^2 a_1} \geq 0$
 $1 \geq \sqrt[3]{\sin^2 a_1}$
 $\sqrt[3]{\frac{1}{8}} \geq \sqrt[3]{\sin^2 a_1} \rightarrow \sin^2 a_1 \leq \frac{1}{8}$
 $\sin^2 a_1 \leq \frac{1}{8} \Rightarrow \sin a_1 \leq \frac{1}{\sqrt{8}} \Rightarrow D_f = \left[k\pi - \frac{\pi}{4}, k\pi + \frac{\pi}{4} \right]$  6

الف) $a_1 - 1 > 0$
 $a_1 > 1$ (I)
 $1 - \log \frac{a_1-1}{\frac{1}{4}} \geq 0 \rightarrow 1 \geq \log \frac{a_1-1}{\frac{1}{4}} \rightarrow \frac{1}{4} \leq a_1 - 1$
 $\Rightarrow \frac{5}{4} \leq a_1$ 9

$D_f = [1, \infty)$ ✓

ب) $a_1(a_1-1) \geq 0$  9

$\Rightarrow (-\infty, 0] \cup [1, +\infty)$ (I)

$a_1^2 - 3a_1 \geq 0$
 $a_1(a_1-3) \geq 0$ (II)
 $\Rightarrow (-\infty, 0) \cup (3, +\infty)$ (II)

$1 - \log \frac{a_1^2-3a_1}{\frac{1}{2}} \neq 0 \Rightarrow \log \frac{a_1^2-3a_1}{\frac{1}{2}} \neq 1$
 $a_1^2 - 3a_1 \neq \frac{1}{2} \Rightarrow a_1^2 - 3a_1 - \frac{1}{2} \neq 0 \Rightarrow (a_1-1)(a_1-2) \neq 0$
 $\Rightarrow a_1 \neq 1, a_1 \neq 2$ (III)

$(I) \cap (II) \cap (III) \rightarrow D_f = (-\infty, -1) \cup (-1, 0) \cup (2, \infty) \cup (3, +\infty)$ ✓

الف) $\sqrt[3]{a_1^2 - a_1^2} \geq 0 \rightarrow \sqrt[3]{a_1^2 - a_1^2} \geq 1 \rightarrow a_1^2 - a_1^2 \geq 1 \rightarrow a_1^2 - 3a_1 + 2 \leq 0$
 $(a_1-1)(a_1-2) \leq 0$
 $D_f = [1, 2]$ ✓ 6

ب) $\sqrt[3]{a_1+2} \neq 0$
 $\sqrt[3]{a_1} \neq -2$
 $a_1 \neq -8$

$\frac{\sqrt[3]{a_1+2}}{\sqrt[3]{a_1+2}} \in \mathbb{C} \rightarrow \sqrt[3]{a_1+2} = \sqrt[3]{a_1} \omega + \epsilon \omega$
 $\sqrt[3]{a_1} - \sqrt[3]{a_1} \omega + \epsilon \omega = 0$
 $\mathcal{A}(\sqrt[3]{a_1} - \sqrt[3]{a_1} \omega) = \epsilon \omega - 0$

$a_1 = \frac{\sqrt[3]{a_1} - \omega}{\sqrt[3]{a_1} - \sqrt[3]{a_1} \omega} \Rightarrow D_f = \left\{ a_1 \mid a_1 = \frac{\sqrt[3]{k} - \omega}{\sqrt[3]{k} - \sqrt[3]{k} \omega}, k \in \mathbb{C} \right\}$ ✓