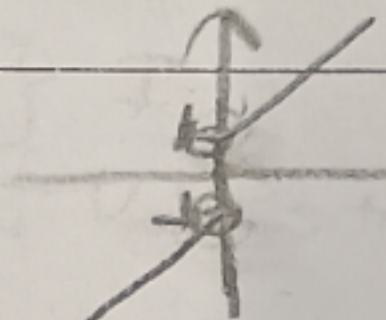
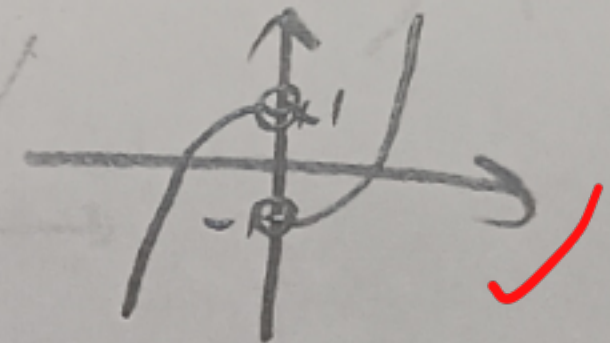


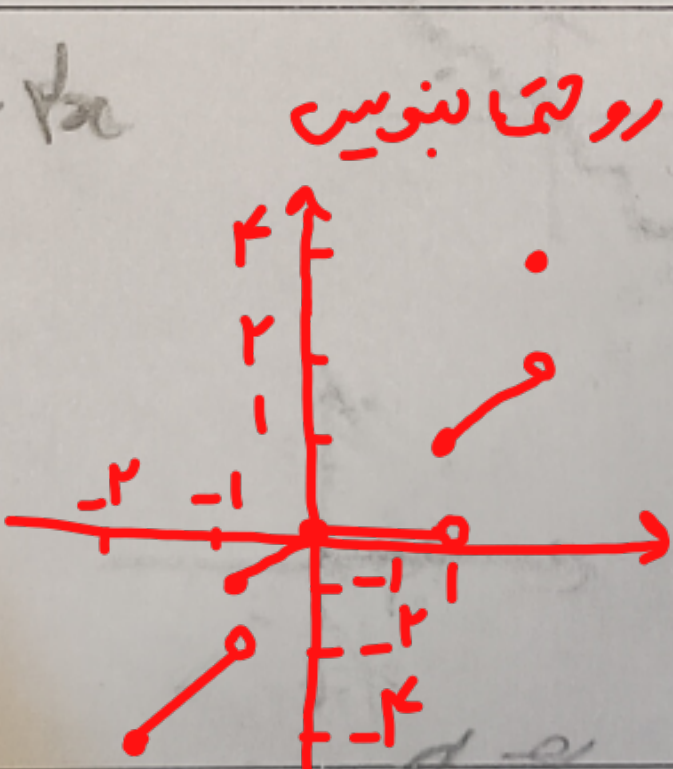
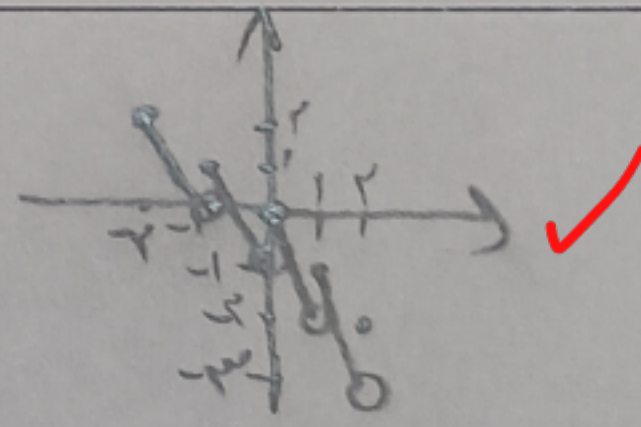
الف) $y = x + |x-1|$ $\begin{cases} x > 1 \rightarrow x + x - 1 = 2x - 1 \\ x = 1 \rightarrow 2 \\ x < 1 \rightarrow x - x + 1 = 1 \end{cases} \rightarrow R_f = [1, +\infty)$ ✓ (۲)

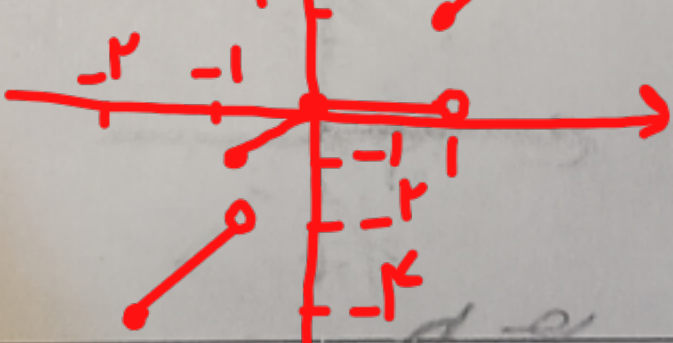
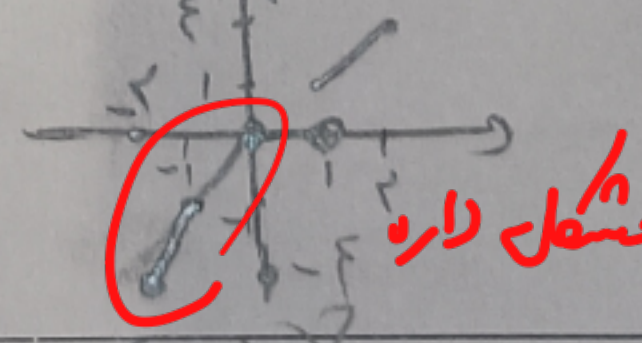
ب) $y = |x-2| + |x-1| - |x|$ $\begin{cases} x > 2 \rightarrow x - 1 - x = -1 \\ 1 < x \leq 2 \rightarrow x - 1 - x + 1 = 0 \\ 0 < x \leq 1 \rightarrow -x + 1 - x = 1 - 2x \\ x \leq 0 \rightarrow -x + 1 - x = 1 - 2x \end{cases} \rightarrow R_f = [-1, +\infty)$ ✓

$|x-2| - |x+2| = k$ $\begin{cases} x > 2 \rightarrow x - 2 - x - 2 = -4 \\ -2 < x \leq 2 \rightarrow -x + 2 - x - 2 = -2 \\ x \leq -2 \rightarrow -x + 2 - x - 2 = -2 \end{cases}$ $\Rightarrow x = 1 \rightarrow k = -3$ ✓

الف) $y = x + \frac{x}{|x|}$ $\begin{cases} x > 0 \rightarrow x + 1 \\ x < 0 \rightarrow x - 1 \end{cases}$  ✓ (۲)

ب) $y = x/|x| - \frac{x}{|x|}$ $\begin{cases} x > 0 \rightarrow 1 - 1 = 0 \\ x < 0 \rightarrow -1 + 1 = 0 \end{cases}$  ✓ (۳)

الف) $y = [x] - \frac{1}{2}x$   ✓ (۵,۷,۵)

ب) $y = [x] |x|$   ✓ (۵,۷,۵)

الف) $y = [x] - [x]$ $\begin{cases} x \in \mathbb{Z} \rightarrow y = 0 \\ x \notin \mathbb{Z} \rightarrow y = 0 \end{cases} \rightarrow R_f = [0, 1)$ ✓ (۱,۵)

ب) $y = [x] - [x]$ $\rightarrow R_f = [0, 1)$ ✓

ج) $y = x - [x] \rightarrow R_f = [0, 1)$ ✓

د) $y = [x] - x \rightarrow R_f = (-1, 0]$ ✓

$$1) y = 2\sin x + 4\cos x \rightarrow R_D = [-\sqrt{20}, \sqrt{20}] \quad [-\sqrt{3}, \sqrt{3}]$$

$$2) y = 2\sin x - 4\cos x \rightarrow R_D = [-\sqrt{20}, \sqrt{20}] \quad \checkmark$$

$$3) y = [2\sin x + 4\cos x] \rightarrow [-\sqrt{20}, \sqrt{20}] \quad \text{برای } R_D = \{-\sqrt{20}, -\sqrt{19}, -\sqrt{18}, -\sqrt{17}, -\sqrt{16}, -\sqrt{15}, -\sqrt{14}, -\sqrt{13}, -\sqrt{12}, -\sqrt{11}, -\sqrt{10}, -\sqrt{9}, -\sqrt{8}, -\sqrt{7}, -\sqrt{6}, -\sqrt{5}, -\sqrt{4}, -\sqrt{3}, -\sqrt{2}, -\sqrt{1}, 0, \sqrt{1}, \sqrt{2}, \sqrt{3}, \sqrt{4}, \sqrt{5}, \sqrt{6}, \sqrt{7}, \sqrt{8}, \sqrt{9}, \sqrt{10}, \sqrt{11}, \sqrt{12}, \sqrt{13}, \sqrt{14}, \sqrt{15}, \sqrt{16}, \sqrt{17}, \sqrt{18}, \sqrt{19}, \sqrt{20}\} \quad \checkmark$$

$$4) y = \sqrt{2}\cos x - 4\sin x \rightarrow [-\sqrt{18}, \sqrt{18}] \quad \text{دو بار رادیکال گرفت}$$

$$5) y = \sin^2 x + 2\sin x + 1 \rightarrow \sin x = -\frac{1}{2} \rightarrow f\left(-\frac{1}{2}\right) = \frac{1}{4} \quad R_D = \left[\frac{1}{4}, 1\right] \quad \text{دقیقاً!}$$

$$6) y = 2\sin^2 x + 3\sin x + 1 \rightarrow \sin x = \frac{1}{2} \rightarrow f\left(\frac{1}{2}\right) = \frac{5}{4} \quad R_D = \left[\frac{5}{4}, 2\right] \quad \text{دقیقاً!}$$

$$7) y = \sin^2 x + \cos^2 x = 1 \rightarrow R_D = [1, 1] \quad \checkmark$$

$$8) y = \frac{2\cos x}{1 + \cos^2 x} \Rightarrow \frac{2\cos x}{\sin^2 x} = 2\cos x \sin^2 x \rightarrow y = \sin^2 x \rightarrow R_D = [-1, 1] \quad \checkmark$$

$$9) y = \sin^2 x + \cos^2 x \quad \text{طبق رابطه} \quad \frac{1}{4} \leq \sin^2 x + \cos^2 x \leq 1 \quad \checkmark$$

$$10) y = [\sin^2 x + \cos^2 x] \quad \text{برای } R_D = \{0, 1\} \quad \checkmark$$

$$11) y = \frac{\sin^2 x + \sqrt{2} - 1}{\cos^2 x} = \frac{\cos^2 x (1 + \sqrt{2} - 1)}{\cos^2 x} \rightarrow y = 1 \rightarrow R_D = \{1\} \quad \checkmark$$

$$12) y = \frac{\sin^2 x - 1}{\cos^2 x} = \frac{\cos^2 x (1 - 1)}{\cos^2 x} \rightarrow y = 0 \rightarrow R_D = \{0\} \quad \checkmark$$

$$D = \mathbb{R} - \{1\}$$

$$f(x) = f(x) = 3 \quad \text{دو به همین ۳ انداز$$

$$y = \frac{1}{2} \rightarrow y = \frac{1}{2} \rightarrow \min \quad R_D = \left[\frac{1}{2}, +\infty\right) \quad \checkmark$$