Subject: ایران شریفی سری هفتم کلاس A

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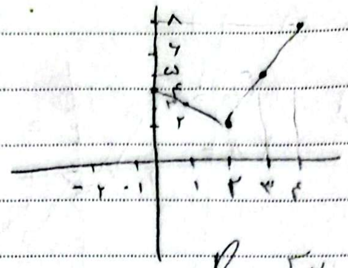
سوال ۱)

الف) $y = x + |2x - 4|$

$2x = 4 \to x = 2$

$x + 2x - 4 = 3x - 4 \quad 2 \leq x \to x = 2 \to 2,\ x = 3 \to 5,\ x = 4 \to 8$

$x - 2x + 4 = -x + 4 \quad 2 > x \to x = 2 \to 2,\ x = 1 \to 3,\ x = 0 \to 4$



$R_f = [2, +\infty)$

ب) $|x-2| + |x-1| - |x|$

$x = 2 \quad x = 1 \quad 0$

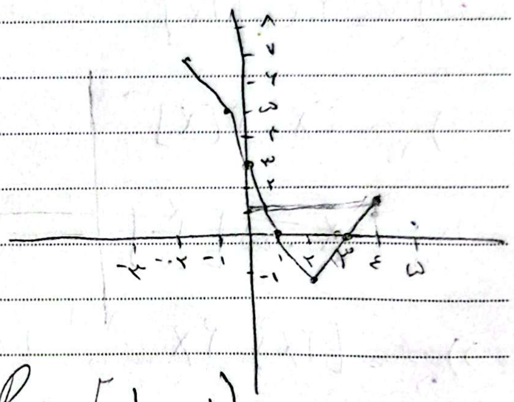
$x = 2 \to -1,\ x = 3 \to 0,\ x = 4 \to 1$

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

$-x + 2 + x - 1 - x = -x + 1 \quad 1 \leq x \leq 2 \quad x = 2 \to -1,\ x = 1 = 0$

$-x + 2 - x + 1 - x = -3x + 3 \quad 0 \leq x \leq 1 \quad x = 0 \to 3,\ x = 1 \to 0$

$-x + 2 - x + 1 + x = -x + 3 \quad x < 0 \to x = 0 \to 3,\ x = -1 \to 5,\ x = -2 \to 7$



$R_f = [-1, +\infty)$

سوال ۲)

$|3x - 3| - |x + 2| = k$

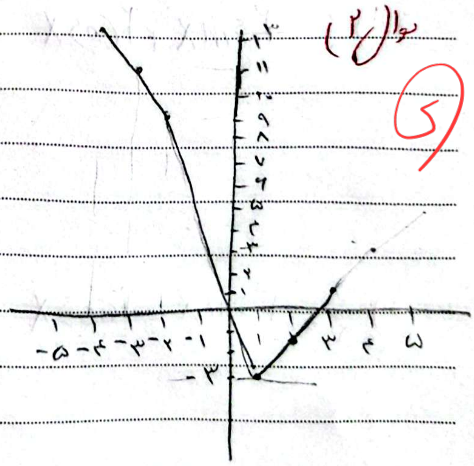
$3x = 3 \quad x = -2$

$x = 1$

$3x - 3 - x - 2 = 2x - 5 \quad 1 \leq x \quad x = 1 \to -3,\ x = 2 \to -1,\ x = 3 \to 1,\ x = 4$

$-3x + 3 - x - 2 = -4x + 1 \quad -2 \leq x \leq 1 \quad x = 1 \to -3,\ x = -2 \to 9$

$-3x + 3 + x + 2 = -2x + 5 \quad x < -2 \to x = -2 \to 9,\ x = -3 \to 11,\ x = -4 \to 13$



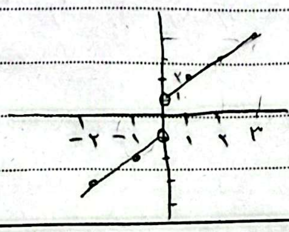
$k = -3 \to$ چون تنها نقطه‌ای است که با خط $y = -3$ برخورد دارد.

سوال ۳)

الف) $y = x + \frac{x}{|x|}$

$x + 1 \quad x > 0$

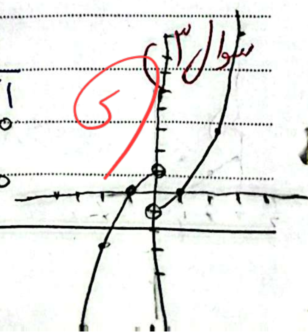
$x - 1 \quad x < 0$



ب) $x|x| - \frac{x}{|x|}$

$x^2 - 1 \quad x > 0$

$-x^2 + 1 \quad x < 0$



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$x=2 \to (2,4)$ $\quad -1\leq x<0 \quad -|x|$

$1\leq x<2 \quad |x| \qquad -2\leq x<-1 \quad -2|x|$

$0\leq x<1 \quad 0$

سوال ۴)

الف) $y=[x]-2x$

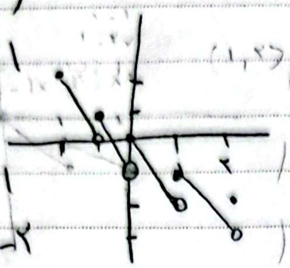
$x=2 \to (2,-2)$

$1\leq x<2 \quad -2x+1$

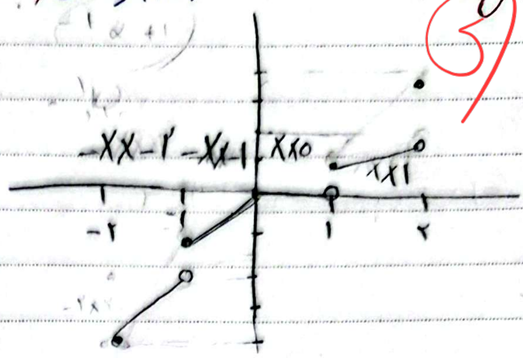
$0\leq x<1 \quad -2x$

$-1\leq x<0 \to -2x-1$

$-2\leq x<-1 \to -2x-2$



ب) $[x]|x|$



سوال ۵)

الف) $y=3x-[3x] \quad 0\leq 3x-[3x]<1 \quad R_f=[0,1)$

ب) $y=4x-4[x] \quad y=4(x-[x]) \to R_f=[0,4)$

ج) $y=x-5[\frac{x}{5}] \quad y=5(\frac{x}{5}-[\frac{x}{5}]) \to R_f=[0,5)$

د) $y=[2x]-2x \xrightarrow{x-1} 2x-[2x] \to R_f=(-1,0]$

سوال ۶)

الف) $y=3\sin x+2\cos x \to -\sqrt{9+4}\leq 3\sin x+2\cos x\leq +\sqrt{9+4}$

$-\sqrt{13}\leq 3\sin x+2\cos x\leq \sqrt{13}$

$R_f=[-\sqrt{13},\sqrt{13}]$

ب) $y=4\sin x-3\cos x \quad -\sqrt{16+9}\leq 4\sin x-3\cos x\leq \sqrt{16+9}$

$R_f=[-5,5]$

ج) $y=[2\sin x+5\cos x] \quad -\sqrt{4+25}\leq 2\sin x+5\cos x\leq +\sqrt{4+25}$

$[2\sin x+5\cos x] \to \{-6,-5,-4,-3,-2,-1,0,1,2,3,4,5\}$

د) $y=\sqrt{\cos x-2\sin x} \quad -\sqrt{4+1}\leq -2\sin x+\cos x\leq +\sqrt{5}$

منفی زیر رادیکال قابل قبول نیست

$R_f=[0,\sqrt{5}]$

Arman

ایران شریفی سری هفتم تکلیف ۸

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سوال ۷)

الف) $y = \sin^2 x + 3\sin x + 2$

$\sin x = \frac{-b}{2a} = -\frac{3}{2}$ $\quad f(-\frac{3}{2}) = +\frac{9}{4} - \frac{18}{4} + \frac{8}{4} = -\frac{1}{4}$ min

$\sin x = 1 \Rightarrow y = 6$ $\quad R_f = [-\frac{1}{4}, 6]$

$\sin x = -1 \Rightarrow y = 1 - 3 + 2 = 0$

ب) $y = 2\sin^2 x + 3\sin x + 2$

$\sin x = \frac{-b}{2a} = \frac{-3}{4}$ $\quad f(-\frac{3}{4}) = 2 \times \frac{9}{16} - \frac{9}{4} + \frac{8}{4} = \frac{9}{8} - \frac{18}{8} + \frac{16}{8} = \frac{7}{8}$ min

$\sin x = 1 \Rightarrow 2 + 3 + 2 = y = 7$ max

$\sin x = -1 \Rightarrow 2 - 3 + 2 = 1$ $\quad R_f = [\frac{7}{8}, 7]$

سوال ۸)

الف) $\sin^2 x + 4\cos^2 x$ $\quad \underbrace{(\sin^2 x + \cos^2 x)}_{1} + 3\cos^2 x$

$0 \leq \cos^2 x \leq 1$

$1 \leq 1 + 3\cos^2 x \leq 4 \Leftarrow 0 \leq 3\cos^2 x \leq 3$

ب) $\frac{2\cot x}{1 + \cot^2 x} \Rightarrow \frac{2\frac{\cos x}{\sin x}}{\frac{1}{\sin^2 x}} = \frac{2\cos \sin^2 x}{\sin x} = 2\cos x \sin x$

$\sin 2x \Rightarrow R_f = [-1, 1]$

سوال ۹)

الف) $y = \sin^6 x + \cos^6 x \Rightarrow (\frac{\sqrt{2}}{2})^6 = \frac{2^3}{2^6} = \frac{1}{8}$

$\underbrace{\frac{1}{8} + \frac{1}{8}}_{\frac{1}{4}} \leq \sin^6 x + \cos^6 x \leq 1 \Rightarrow R_f = [\frac{1}{4}, 1]$

ب) $y = [\sin^8 x + \cos^8 x]$ $\quad (\frac{\sqrt{2}}{2})^8 = \frac{2^4}{2^8} = \frac{1}{16}$

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$\underbrace{\frac{1}{16} + \frac{1}{16}}_{\frac{1}{8}} \leq \sin^8 x + \cos^8 x \leq 1 \Rightarrow [\sin^8 x + \cos^8 x] \Rightarrow \{0, 1\}$

$R_f = \{0, 1\}$

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الف) $y = \dfrac{2x^2+7x-4}{x+4}$

$2x^2+7x-4 \;\big|\; x+4$, quotient $2x-1$

$-2x^2 - 8x$

$-x-4$

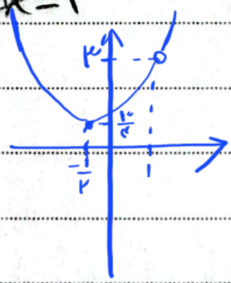
$-x-4$

0

$y = \dfrac{(2x-1)\cancel{(x+4)}}{\cancel{x+4}} = 2x-1$

$x = -4 \to 2x-1 \to -9$ $\quad R_f = \mathbb{R} - \{-9\}$

ب) $y = \dfrac{x^3-1}{x-1} = \dfrac{\cancel{(x-1)}(x^2+x+1)}{\cancel{x-1}} \to x = \dfrac{-b}{2a} = \dfrac{-1}{2}$ $\quad y = \dfrac{1}{4} - \dfrac{1}{2} + 1 = \dfrac{3}{4}$



$R_f = [\frac{3}{4}, +\infty) - \{3\}$