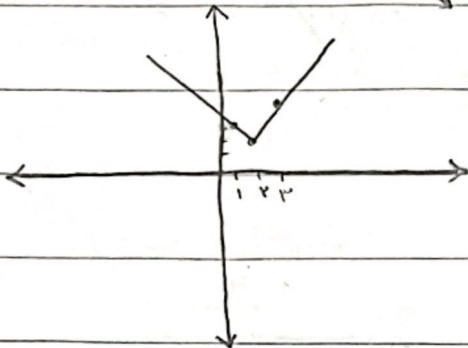


الف) $y = x + |2x - 4|$

$$\begin{cases} x > 2 & 2x - 4 \\ x = 2 & x \\ x < 2 & -x + 4 \end{cases}$$

①

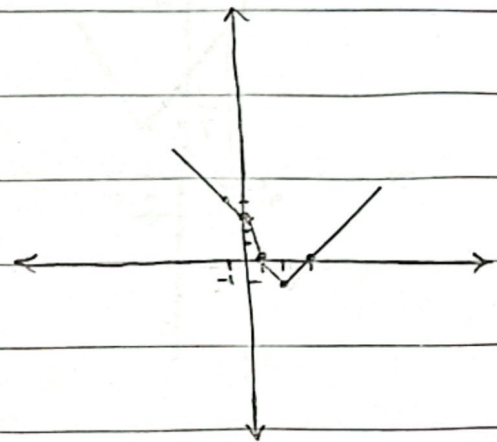


$$R_f = [2, +\infty)$$

ب) $y = |x - 2| + |x - 1| - |x|$

0	1	2
$-x + 3$	$-x + 2$	$-x + 1$

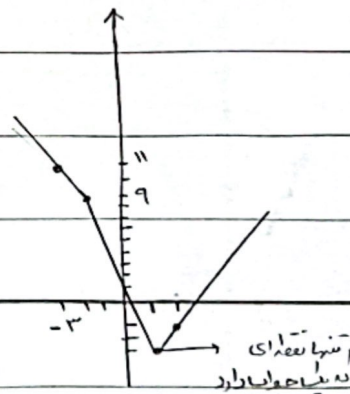
$$R_f = [-1, +\infty)$$



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

-2	1
$-2x + 5$	$2x - 5$

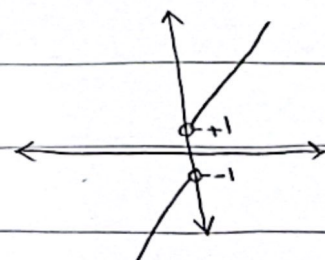
$$k = -3$$



②

الف) $y = x + \frac{x}{|x|}$

$$\begin{cases} x > 0 & \rightarrow x + 1 \\ x < 0 & \rightarrow x - 1 \\ x \neq 0 \end{cases}$$

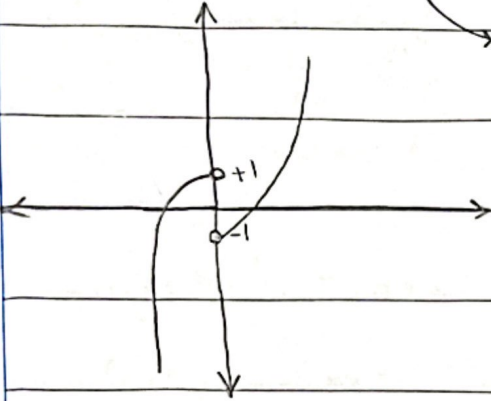


③

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ب) $y = x|x| - \frac{x}{|x|}$

$x > 0 \rightarrow x^2 - 1$
 $x < 0 \rightarrow -x^2 + 1$
 $x \neq 0$



الف) $y = [x] - 2x$

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

(K)

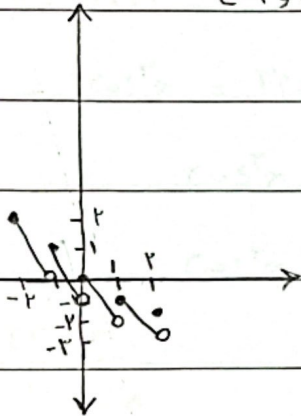
$[-2, 2]$

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

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

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

$x = 2 \rightarrow (-2)$



ب) $y = [x]|x|$

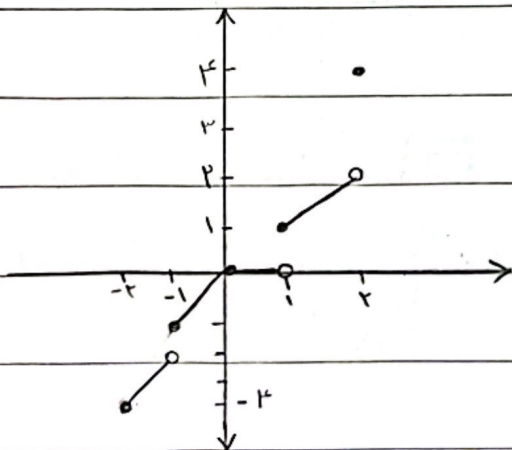
$0 \leq x < 1 \rightarrow 0$

$1 \leq x < 2 \rightarrow x$

$x = 2 \rightarrow 2$

$-1 \leq x < 0 \rightarrow x$

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



$$\text{الف) } y = rx - [rx]$$

$$Rf = [0, 1)$$

$$\text{ب) } y = rx - r|x| \rightarrow r(x - |x|) \rightarrow r \underbrace{(x - |x|)}_{[0, 1)}$$

$$Rf = [0, r)$$

$$\text{ج) } y = x - \omega \left[\frac{x}{\omega} \right] \rightarrow \omega \left(\frac{x}{\omega} - \left[\frac{x}{\omega} \right] \right) \rightarrow \omega \underbrace{\left(\frac{x}{\omega} - \left[\frac{x}{\omega} \right] \right)}_{[0, 1)}$$

$$Rf = [0, \omega)$$

$$\text{د) } y = [rx] - rx \rightarrow [-1, 0] = Rf$$

$$y = r \sin x + r \cos x$$

$$-\sqrt{1r} \leq r \sin x + r \cos x \leq \sqrt{1r}$$

$$Rf = [-\sqrt{1r}, \sqrt{1r}]$$

$$y = r \sin x - r \cos x$$

$$-\sqrt{1r} \leq r \sin x - r \cos x \leq \sqrt{1r}$$

$$-\omega \leq r \sin x - r \cos x \leq \omega$$

$$Rf = [-\omega, \omega]$$

$$y = [r \sin x + \omega \cos x]$$

$$-\sqrt{1r} \leq r \sin x + \omega \cos x \leq \sqrt{1r}$$

$$[-\sqrt{1r}] = -r \quad [\sqrt{1r}] = \omega$$

$$Rf = \{-r, -\omega, -r, -r, -r, -1, 0, 1, r, r, r, \omega\}$$

$$y = \sqrt{\cos x - r \sin x}$$

$$-\sqrt{\omega} \leq \cos x - r \sin x \leq \sqrt{\omega}$$

$$Rf = [0, \sqrt{\omega}]$$

الف) $y = \sin^2 x + r \sin x + r$

(V)

$\sin x \begin{cases} +1 \Rightarrow y = y \\ -1 \Rightarrow y = y \\ \frac{-b}{r a} = \frac{-r}{r} \end{cases} \rightarrow Rf = [0, 4]$
 $-1 \leq \sin x \leq 1$

ب) $y = \sin^2 x + r \sin x + r$

$\sin x \begin{cases} +1 \Rightarrow y = v \\ -1 \Rightarrow y = 1 \\ \frac{-b}{r a} = \frac{-r}{r} \Rightarrow y = \frac{v}{\lambda} \end{cases} \rightarrow Rf = \left[\frac{v}{\lambda}, v \right]$

الف) $\sin^2 x + r \cos^2 x$

(A)

$1 - \cos^2 x + r \cos^2 x = r \cos^2 x + 1$

$\cos^2 x = 0 \rightarrow y = 1$

$Rf = [1, r]$

$\cos^2 x = 1 \rightarrow y = r$

ب) $y = \frac{r \cot x}{1 + \cot^2 x}$

$y = \frac{\frac{r \cos x}{\sin x}}{\frac{\sin^2 x + \cos^2 x}{\sin^2 x}} = \frac{r \cos x \sin x}{\sin^2 x + \cos^2 x} \rightarrow y = \sin^2 x$
 $Rf = [-1, 1]$

الف) $y = \sin^4 x + \cos^4 x$

(9)

$r^{-2} \leq \sin^4 x + \cos^4 x \leq 1$

$Rf = \left[\frac{1}{r}, 1 \right]$

ب) $y = [\sin^4 x + \cos^4 x]$

$r^{-2} \leq \sin^4 x + \cos^4 x \leq 1 \rightarrow \left[\frac{1}{r}, 1 \right] \rightarrow Rf = \left\{ 0, 1 \right\}$

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$$\text{a)} \quad y = \frac{rx^r + \sqrt{x} - r}{x+r} \quad x \neq -r$$

(10)

$$y = \frac{(x+r)(rx-1)}{(x+r)} = rx-1 \quad \begin{matrix} \nearrow r(-r) - 1 = -9 \\ \searrow y+1 = rx \end{matrix}$$

$$x = \frac{y+1}{r} \rightarrow Rf = R - \{9\}$$

$$\text{b)} \quad y = \frac{x^r - 1}{x-1} = \frac{(x-1)(x^r + 1 + x)}{(x-1)} \rightarrow y = x^r + 1 + x$$

$$x^r + x + 1 - y = 0$$

$$x = \frac{-1 \pm \sqrt{1 - r + ry}}{r} \rightarrow ry - r \geq 0$$

$$y \geq \frac{r}{r}$$

$$Rf = \left[\frac{r}{r}, +\infty \right)$$