

الف) $y = \frac{\ln|z|}{\ln|z-2|}$

$\ln|z| = \frac{-\ln y - 1}{y-1} = \frac{\ln y + 1}{y-1} \geq 0$

$y \mid \frac{1}{y-1} \mid \frac{1}{y} \mid + \quad R_f: (-\infty, -\frac{1}{y}] \cup (1, +\infty)$

ب) $y = \frac{\ln^2 + 1}{\ln} \Rightarrow y = \frac{\ln^2 + 1}{\ln} \quad \frac{a = \ln}{a > 0}$

$R_f: [2, +\infty)$

$y = \frac{n^2 + rn - r}{n+r} \rightarrow y(n+r) = n^2 + rn - r \rightarrow n^2 + (r-y)n - r - ry = 0$

$n = \frac{-b \pm \sqrt{\Delta}}{2a} \quad \Delta = (r-y)^2 - 4(1)(-r-ry) \geq 0 \rightarrow r - y + y^2 + 1 + ry \geq 0$

$y^2 + ry + 1 + r \geq 0 \rightarrow (y+r)(y+1) \geq 0 \quad y \mid \frac{-r}{2} \mid \frac{-r}{2} \mid + \quad R_f: (-\infty, -4] \cup [-2, +\infty)$

$f(n) = \frac{n^2 - n + \frac{1}{2}}{n^2 - n + 1} \neq 0 \rightarrow \begin{cases} a > 0 \\ \Delta = b^2 - 4ac = 1 - 4(1)(\frac{1}{2}) < 0 \end{cases} \Rightarrow D_f: \mathbb{R}$

$f(n)n^2 - f(n)n + \frac{1}{2} = n^2 - n + \frac{1}{2} \rightarrow (1 - f(n))n^2 + (-1 + f(n))n + (\frac{1}{2} - f(n)) = 0$
 $0 = (f(n)-1)^2 - 4(-f(n)+1)(-\frac{1}{2} + f(n)) = -2f(n) + 2f(n)^2 \geq 0 \rightarrow f(n)(f(n)-1) \geq 0 \rightarrow \frac{f(n)}{-1} \mid \frac{0}{-1} \mid \frac{1}{-1} \mid -$

$R_f: [0, 1]$

الف) $y = \sqrt{-n^2 + 2n - 1}$

$a < 0 \rightarrow \begin{cases} n_{\max} = \frac{-b}{2a} = \frac{-2}{-2} = 1 \\ y_{\max} = -1 + 1 - 1 = -1 \end{cases}$

$R_f: \sqrt{(-\infty, 1]} \rightarrow R_f: [0, \sqrt{2}]$

ب) $y = \sqrt{2n^2 - 4n}$

$a > 0 \rightarrow \begin{cases} n_{\min} = \frac{1}{2} = 1 \\ y_{\min} = 1 - 1 = 0 \end{cases}$

$R_f: \sqrt{[-1, +\infty)} \rightarrow R_f: [-2, +\infty)$

الف) $y = \ln_y(n^2 - n + 1)$

ب) $y = \ln_y\left(\frac{n^2+1}{n}\right) > 0 = \ln_y\left(\frac{n+\frac{1}{n}}{1}\right) > 0$

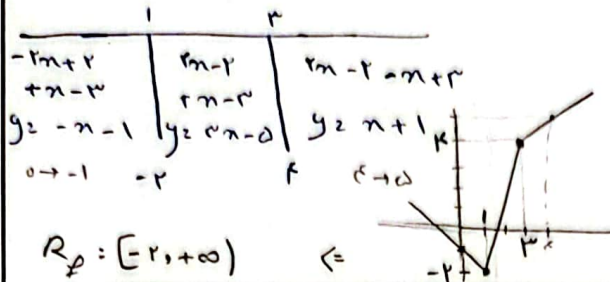
$(-\infty, -2] \cup [2, +\infty) : y \mid \frac{1}{y} \mid \frac{1}{y} \mid +$

$\ln_y \begin{cases} \ln_y 2 = 1 \\ \ln_y +\infty = +\infty \end{cases} \rightarrow R_f: [1, +\infty)$

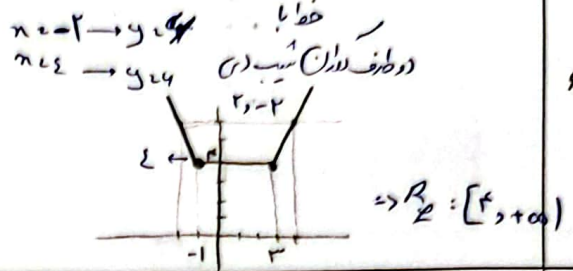
برای آنکه تابع از مرتبه اول باشد

$\ln \rightarrow R_f: \mathbb{R}$

الف) $y = |r - r| - |n - r|$

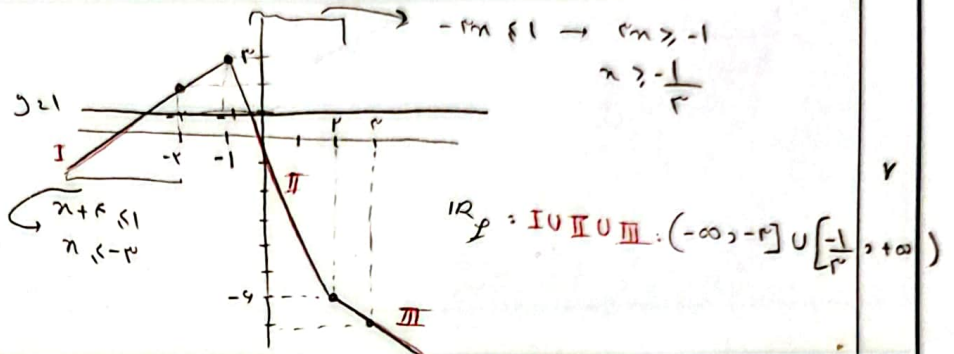
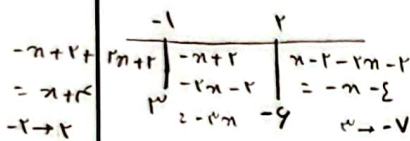


ب) $y = |n - r| + |n + 1|$ $y \leq \frac{n+r}{n-1}$

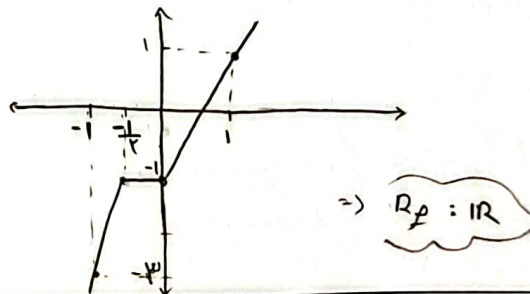
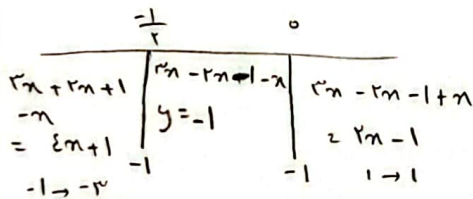


$|n - r| - |r + r| \leq 1$

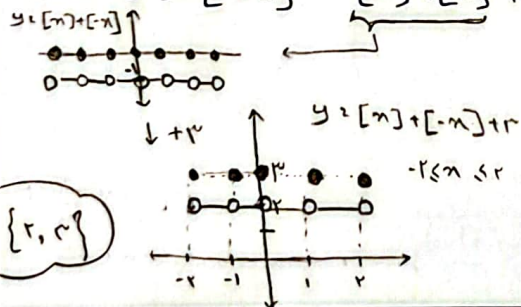
$|n - r| - |r + r| = 0$
 $r \leq -1$



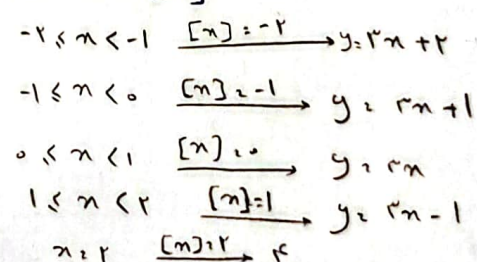
$y = r - |r + r| + |n|$
 $-\frac{1}{r}$



الف) $y = [n] + [r - n] = [n] + [n] + r$



ب) $y = r - [n]$



الف) $y = \sin^n - \sin^n + 1$

(min) $\sin^n = -1 \rightarrow y = r$
 (max) $\sin^n = 1 \rightarrow y = 1$ $R_f = [\frac{r}{r}, r]$

$(-\frac{b}{ra})$ $\sin^n = \frac{1}{r} \rightarrow y = \frac{1}{2} - \frac{1}{r} + 1 = \frac{r}{r}$

$y = \sin^n + \sin^n + 1$

(min) $\sin^n = 0 \rightarrow y = 1$ $R_f = [1, r]$
 (max) $\sin^n = 1 \rightarrow y = r$

$(-\frac{b}{ra})$ $\sin^n = \frac{1}{r} \rightarrow y = \frac{1}{2} \rightarrow \sin^n \neq \frac{1}{r}$

$y = r - [n]$
 $-r \leq n \leq r$

