

Subject:

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الف) $\frac{|x|+1}{|x|-r}$ $\max |x| = +\infty \rightarrow y = 1$
 $\min |x| = 0 \rightarrow y = -\frac{1}{r} \rightarrow Rf = (-\infty, -\frac{1}{r}] \cup (1, +\infty)$

ب) $y = \frac{x^2+1}{|x|} = |x| + \frac{1}{|x|} \rightarrow a + \frac{1}{a} \geq r \rightarrow |x| + \frac{1}{|x|} \geq r \rightarrow Rf = [r, +\infty)$

$y = \frac{x^2+rx-r}{x+r} \rightarrow x^2 + (r-y)x - r - ry = 0 \rightarrow x = \frac{y-r \pm \sqrt{y^2 - 4y + 4 + 4ry + 4r}}{2}$

$\rightarrow y^2 - 4y + 4 + 4ry + 4r \geq 0 \rightarrow (y+r)(y+r) \geq 0 \rightarrow Rf = (-\infty, -r] \cup [r, +\infty)$

10. $f(x) = \frac{x^2-x+\frac{1}{x}}{x^2-x+1} = 1 - \frac{r}{r(x^2-x+1)}$

$x^2-x+1 \neq 0$
 $\Delta = -3 < 0$ $\checkmark$
 $x^2-x+1 \geq 0 \rightarrow x \in \mathbb{R}$
 $x = \frac{1}{r} \rightarrow \frac{-r}{r(x^2-x+1)} \rightarrow \frac{-r}{r(x^2-x+1)} \rightarrow [-1, 0)$

$Rf = [0, 1)$
 $Df = \mathbb{R}$

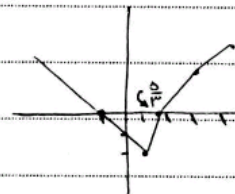
15. $y = \sqrt{-x^2+rx-1} \rightarrow -x^2+rx-1 \geq 0 \rightarrow (-\infty, r] \rightarrow [0, \sqrt{r}]$

ب) $y = \sqrt[3]{rx^2-1} \rightarrow rx^2-1 \geq 0 \rightarrow x \in [-\frac{1}{r}, +\infty) \rightarrow Rf = [-\frac{1}{r}, +\infty)$

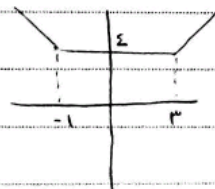
20. الف) $\log(x^2-x+1)$ $x^2-x+1 > 0 \rightarrow \mathbb{R} \rightarrow \log(-\infty, +\infty)$
 $\log(0, +\infty) \rightarrow Rf = \mathbb{R}$

ب) $\log_r(\frac{x^2+1}{x}) \rightarrow \log_r(x + \frac{1}{x})$
 $x > 0 \rightarrow \log_r(x + \frac{1}{x}) \rightarrow Rf = [1, +\infty)$
 $x < 0 \rightarrow \log_r(x + \frac{1}{x}) \rightarrow \mathbb{R}$

25. الف) $y = |rx-r| - |x-r| \rightarrow Rf = [-r, +\infty)$



ب) $y = |x-r| + |x+1| \rightarrow Rf = [r, +\infty)$



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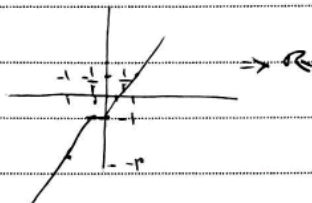
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$$|x-r| - |r_x+r| \leq 1 \rightarrow -x+r, r_x+r \leq 1 \rightarrow x \leq -r$$

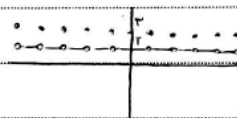
$$-x + r - rx - r \leq 1 \rightarrow -1 \leq rx \rightarrow \frac{-1}{r} \leq x$$

$$x \in (-\infty, -\frac{1}{p}] \cup [-\frac{1}{p}, +\infty)$$

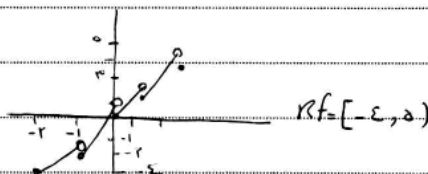
$$5. y = 3x - |x+1| + |x|$$



10 الف) $y = [x] + [x - x] = [x] + [-x] + 3$



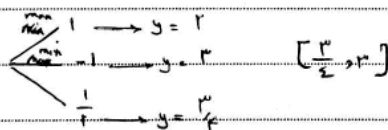
c) $3\gamma - [x]$



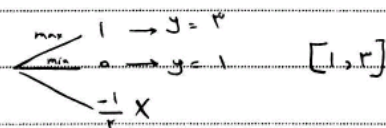
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$\sin^2 x - \sin x + 1$

 $y = r$
 $x = r$



20. $y = \sin^2 x + \sin^2 x + 1 \begin{cases} \max & 1 \rightarrow y = 3 \\ \min & 0 \rightarrow y = 1 \end{cases} [1, 3]$



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