

$f(u)$ $\downarrow$ $Op = [-r, r]$ $f(u-r)$ $\downarrow$ $Op = [-r, r]$ $-r \leq u-r \leq r$ $-r \leq u \leq 2r$ $-\frac{r}{2} \leq u-r \leq \frac{r}{2} \Rightarrow Op = [-\frac{r}{2}, \frac{r}{2}]$ ✓	$f(u+r)$ $\downarrow$ $Op = [-r, r]$ $P(u)$ $\downarrow$ $Op = ?$ $-r \leq u+r \leq r$ $-r \leq u \leq -2r$ $-r \leq u-r \leq -1 \Rightarrow Op = [-1, -r]$ ✓	۱
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$u-r \Rightarrow \begin{cases} \text{محدود} \\ \text{نامحدود} \end{cases} \rightarrow P(u) = (u-r) + \sqrt{(u-r)-r}$ $u=y \xrightarrow{\text{محدود}} y = (u-r) + \sqrt{(u-r)-r} \Rightarrow u = y-r + \sqrt{y-r} \rightarrow y \leq y-r + \sqrt{y-r}$ $\xrightarrow{\text{محدود}} y \leq \sqrt{y-r} \Rightarrow y \leq 1$ ✓	۲
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$g(u) \leq f(u-r)$ 	$g(u) \leq f(u+r)$ 	$g(u) = f(u+r)$ 	$g(u) = f(u)$ 	۳
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$P(r) = w$ $r-u-1 = a+r \Rightarrow f\left(\frac{u-a}{r}\right) \Rightarrow f\left(\frac{u-a}{r}\right) \leq \frac{r-u-1-a}{r}$ $\frac{u-a}{r} \leq r \rightarrow u-a \leq r$ $\frac{r-u-1-a}{r} \leq w \rightarrow r-u-1-a \leq r w$ $\rightarrow u \leq -r$ $a \leq -r$ ✓	۴
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$y = f(u-r)$ 	$y \leq f(u-r)$ 	$y \leq f(u)$ 	$y \leq f(u+r)$ 	$y \leq f(-u+r)$ 	۵
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$f(u)$

$f(u-1)$

$f(u-1)$

$y = \sqrt{-(u-r)f(u-1)}$
 $\downarrow \quad \quad \quad \downarrow$
 $-r \quad \quad \quad 0, 1, r$
 $1 - \frac{r}{r} + \frac{r}{r} - \frac{r}{r} + \frac{r}{r}$
 $OP = [r, 0] \cup [r, r]$

$f(u) = |u-r|+1$
 $\xrightarrow{\text{substituting } k} y = |r(u-k)-r|+1$
 $\xrightarrow{\text{substituting } k} y = |r(u-k)-r|+1$

$\Rightarrow \frac{r}{r} + 1 = |rk-r|-r$
 $\rightarrow rk-r = 4 \rightarrow k = 5, 0$
 $\rightarrow rk-r = -4 \rightarrow k = -1, 0$

$f(u) = \frac{r(u-1)}{u+1}$
 $f(u) = \frac{-\frac{r}{u} + 1}{\frac{u}{r} + 1} = \frac{r-ru}{u+r} \Rightarrow g(u) = \frac{r-ru}{u+r} + k$

$f(u)$
 $g(u)$

$k = 5$
 $\checkmark$

$y = f(\frac{u}{r}) + r$

$y = f(\frac{u}{r})$

$y = f(\frac{u}{r})$

$y = f(u)$

$y = f(u-1)$

$1 \times (\frac{r}{r} - \frac{r}{r})$
 $\checkmark$

$f(u) = |u-a| - r$

$\frac{(a-r)(a-r)}{r} = \frac{(a+r)(a-r)}{r} = \frac{a}{r}$
 $\frac{(a-r)(a-r)}{r} = \frac{1}{r} \rightarrow (a-r)^2 = 1$
 $a-r = 1 \rightarrow a = r+1$
 $a-r = -1 \rightarrow a = r-1$

$f(\frac{1}{r}) = \frac{r}{r}$

$1, 0$
 $\checkmark$