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$$f(-x) - xf(x) = r|x|+1 \rightarrow xf(-x) - x^r f(x) = \cancel{1/x} x(r|x|+1) \quad \text{Lec (1) 1a-1b}$$

$$f(x) + xf(-x) = r|-x|+1 \rightarrow -f(x) - xf(-x) = -(r|x|+1)$$

$$f(x) = -(\cancel{x^r+1})f(x) = \frac{(x-1)(r|x|+1)}{-(x^r+1)} \Rightarrow f(x) = \frac{(x-1)(r|x|+1)}{-(x^r+1)}$$

$$x=0 \rightarrow rf(0) = 0 - 0 + 1 = 1 \Rightarrow f(0) = 1 \Rightarrow f(x) = x^r - rx + 1$$

$$f(x^r) = x^r - rx^r + 1$$

$$yx - y = x^r + x + r \Rightarrow x^r + (1-y)x + y + r = 0$$

$$y^r - ry - v = (y+1)(y-v)$$

$$x = \frac{y-1 \pm \sqrt{y^2 - y + 1 - y + r}}{r} = \frac{y-1 \pm \sqrt{y^2 - 2y + 1 + r}}{r}$$

$$\begin{array}{c} -1 & v \\ + & - \\ 0 & 0 \end{array}$$

$$Ry = (-\infty, -1] \cup [v, +\infty)$$

$$10) y = rx^r - ax + 1 \rightarrow y = \frac{rx^r}{\frac{1}{x}} - ax \frac{1}{x} + 1 = \frac{-14}{x} \quad Ry = \left[\frac{-14}{x}, +\infty \right)$$

$$15) y = \sqrt{-x^r + rx - a} \Rightarrow y = \sqrt{-x^r + rx - 9 + 2} \Rightarrow y = \sqrt{-(x-r)^2 + 2}$$

$$A = -(x-r)^2 + 2 \Rightarrow R_A = (-\infty, 2] \Rightarrow Ry = [0, 2]$$

$$20) y = \sqrt{x^v - rx^r + rx + 1} \rightarrow A = x^v - rx^r + rx + 1 \rightarrow R_A = R_x \Rightarrow Ry = [0, +\infty)$$

$$y) \log(x^r - 4x^r + vx + 2) = \log A \rightarrow A > 0 \quad Ry = (-\infty, +\infty)$$

$$25) y = \frac{rx+1}{rx-4} \Rightarrow Ry = R_x - \left\{ \frac{r}{r} \right\}$$

$$y = \sqrt{\frac{rx+1}{x-r}} = \sqrt{A} \rightarrow R_A = R_x - \{r\} \Rightarrow Ry = [0, +\infty) - \{r\}$$

$$y = \sqrt{x^r + r} + \frac{1}{\sqrt{x^r + r}} \Rightarrow y \geq \sqrt{r} + \frac{1}{\sqrt{r}} \Rightarrow y \geq \frac{r+1}{\sqrt{r}} \quad Ry = \left[\frac{r+1}{\sqrt{r}}, +\infty \right)$$

$$y) x^r + r + \frac{1}{x^r + r} \geq \frac{x^r + r + 2}{2} \Rightarrow y \geq \frac{1}{2} \quad Ry = \left[\frac{1}{2}, +\infty \right)$$

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$$y = \frac{rx^r + \varepsilon}{x^r - 1} \Rightarrow yx^r - y = rx^r + \varepsilon \rightarrow rx^r - yx^r + \varepsilon + y = 0$$

$$(r-y)x^r + y + \varepsilon = 0 \Rightarrow x = \frac{0 \pm \sqrt{-r(r-y)(y+\varepsilon)}}{r(r-y)} \rightarrow (-\infty, -\varepsilon] \cup [r, +\infty)$$

$$R_y = (-\infty, -\varepsilon] \cup (r, +\infty)$$

$$5. \min = 0 - \varepsilon \quad \max = +\infty \quad r \quad \xrightarrow{+1} (-\infty, -\varepsilon] \cup (r, +\infty)$$

$$f(x) = \frac{r \sin x + \varepsilon}{\sin x - r} \quad \begin{matrix} \min -1 & -\frac{1}{r} \\ \max 1 & -r \end{matrix} \quad \left[-r, -\frac{1}{r}\right]$$

10.

$$a) y = \left| \frac{rx-1}{rx} \right| \rightarrow \frac{rx-1}{rx} \rightarrow R_1 = \left\{ \frac{r}{2} \right\} \xrightarrow{\sqrt{}} [0, +\infty) - \left\{ \frac{r}{2} \right\}$$

$$b) y = \sqrt{\frac{9(x-r)}{r(x-r)}} = \sqrt{\frac{9}{r}} = \frac{r}{r} \quad R_y = \left\{ \frac{r}{r} \right\}$$

$$15. y = \begin{cases} x^r - rx & x \geq 0 \\ -x^r - rx & x < 0 \end{cases}$$

$$y = f(|x|) \quad \begin{matrix} -w & w \\ -r \end{matrix}$$

$$20. y = f(|x|) + 1 \quad \begin{matrix} -w & w \\ -2 & 2 \\ -1 \end{matrix}$$

$$y = |f(|x|) + 1| \quad \begin{matrix} -w & w \\ -2 & 2 \end{matrix}$$

25.

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