

$$f(x) = 1 - \frac{a}{x} \quad f(1) = 1 - a \quad f(r) = 1 - \frac{a}{r} \quad \frac{(1 - \frac{a}{r}) - (1 - a)}{r - 1} = \frac{a}{r} \quad f'(x) = \frac{a}{x^2} = \frac{a}{r} \Rightarrow x = \pm \sqrt{r} \quad (1)$$

$$\Rightarrow x = \sqrt{r} \quad \text{و} \quad x = -\sqrt{r} \quad \text{و} \quad \text{و}$$

$$y = 2ax^r - \omega x + 11a \Rightarrow f'(x) = 2ax^r - \omega = 1 \Rightarrow 2ax^r = 1 \Rightarrow ax = \frac{1}{r} \quad y = 2ax^r - \omega x + 11a = 2x - 9x + 11a = -7x + 11a \quad (2)$$

$$y = 2x - 9x + 11a = 0 \Rightarrow 11a = 7x \Rightarrow x = \frac{7}{11}a \quad 4a^r = \frac{1}{r} \Rightarrow a^r = \frac{1}{r} \Rightarrow a = \left\{ \frac{1}{r} \quad \text{و} \quad \frac{1}{-r} \right\}$$

$$y = x^r - 12x + r \Rightarrow f'(x) = rx^{r-1} - 12 = 0 \Rightarrow x^r = \frac{12}{r} \Rightarrow x = \pm \sqrt[r]{\frac{12}{r}} \quad \begin{array}{c} -r \quad r \\ + \quad - \quad + \\ \uparrow \quad \downarrow \quad \uparrow \end{array} \quad \min \left| \frac{r}{-12} \right| \quad y = -12 \quad (3)$$

$$y = x^r + ax^r - 2bx - r \Rightarrow f'(x) = rx^{r-1} + rax^r - 2b = 0 \quad x = 0 \Rightarrow -2b = 0 \Rightarrow b = 0 \quad x = -r \Rightarrow 12 - 4a - 2b = 0 \Rightarrow 12 - 4a = 0 \Rightarrow a = 3 \quad y = x^r + 3x^r - r \quad d = \sqrt{(r)^r + (-r)^r} = r\sqrt{2} \quad (4)$$

$$f(x) = x^r - \omega|x| \Rightarrow \begin{cases} x^r - \omega x & x \geq 0 \\ x^r + \omega x & x < 0 \end{cases} \quad \Rightarrow |f(x)| \quad \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ \uparrow \quad \downarrow \quad \uparrow \end{array} \quad \frac{r}{m} = \frac{r}{r} \quad (5)$$

$$f(x) = x(|x| + r) \Rightarrow \begin{cases} x^r + rx & x \geq 0 \\ -x^r + rx & x < 0 \end{cases} \quad \Rightarrow |f(x)| \quad \begin{array}{c} \uparrow \quad \downarrow \quad \uparrow \\ \uparrow \quad \downarrow \quad \uparrow \end{array} \quad \Rightarrow \text{یک نقطه بحرانی} \quad (6)$$

$$f(x) = \sqrt[r]{x^r} |x - a| \Rightarrow f(x) = -\sqrt[r]{x^r} (x - a) \Rightarrow f'(x) = -\frac{rx}{r\sqrt[r]{x^r}} (x - a) - \sqrt[r]{x^r} = \frac{x(a - r)}{\sqrt[r]{x^r}} \quad (7)$$

$$f(x) = \sqrt{x|x| - x} \Rightarrow \begin{cases} \sqrt{x^2 - x} & x \geq 0 \\ \sqrt{-x^2 - x} & x < 0 \end{cases} \Rightarrow f(x) = \begin{cases} \frac{2x-1}{2\sqrt{x^2-x}} \\ \frac{-2x-1}{2\sqrt{-x^2-x}} \end{cases} \quad \begin{array}{c} -1 \quad -\frac{1}{r} \quad 0 \quad 1 \\ \swarrow \quad \downarrow \quad \swarrow \quad \downarrow \\ \swarrow \quad \downarrow \quad \swarrow \quad \downarrow \end{array} \quad (8)$$

$$\max \left| \frac{-1}{r} \right| \quad \min = 0 \quad \text{نقاط بحرانی: } \left| \frac{-1}{0} \right| = \left| \frac{0}{0} \right| = \left| \frac{0}{0} \right| \quad \frac{km+n}{k-n} = \frac{r(1)+0}{r-0} = 1$$

$$y = \frac{mx+r}{x-1+m} \Rightarrow f'(x) = \frac{m(x-1+m) - m(x-1)}{(x-1+m)^2} = \frac{m^2 - m - r}{(x-1+m)^2} \quad f'(x) < 0 \Rightarrow -1 < m < r \Rightarrow m \in \{0, 1\} \quad (9)$$

$$f(x) = \frac{x}{1-x|x|} \Rightarrow \begin{cases} \frac{x}{1-x^2} & x \geq 0 \\ \frac{x}{1+x^2} & x < 0 \end{cases} \Rightarrow f'(x) = \begin{cases} \frac{1+x^2}{(1-x^2)^2} & x \geq 0 \\ \frac{1-x^2}{(1+x^2)^2} & x < 0 \end{cases} \quad \begin{array}{c} -1 \quad 1 \\ - \quad + \quad + \\ \downarrow \quad \uparrow \quad \uparrow \end{array} \quad \Rightarrow \text{یک نقطه بحرانی} \quad (10)$$