

1- $f(x) = 1 - \frac{a}{x} \rightarrow f'(x) = \frac{a}{x^2}$

$\frac{f(2) - f(1)}{2-1} = f'(n) \Rightarrow \frac{1 - \frac{a}{2} - (1 - \frac{a}{1})}{1} = \frac{a}{n^2} \Rightarrow \frac{-\frac{a}{2} + a}{1} = \frac{a}{n^2} \Rightarrow \frac{a}{2} = \frac{a}{n^2}$

$n^2 = 2 \rightarrow n = \sqrt{2}$

2- $y = 2ax^2 - 8x + 18a$
 $y = x$

$2ax^2 - 8x + 18a = x \rightarrow 2ax^2 - 9x + 18a = 0 \Rightarrow ax^2 - 3x + 9a = 0$

$4 - (8 \times 9a) = 0 \rightarrow a^2 = \frac{1}{9}$

$a = \pm \frac{1}{3} \rightarrow a = -\frac{1}{3}$

3- $f(x) = x^3 - 12x + 2 \rightarrow f'(x) = 3x^2 - 12$

$3x^2 - 12 = 0 \Rightarrow x^2 = 4 \Rightarrow x = \pm 2$

$\min = f(2) = 8 - 24 + 2 = -14$

Sign chart: $\begin{matrix} & -2 & & 2 & \\ & + & & - & \\ & & & & + \end{matrix}$

4- $f(x) = x^3 + ax^2 - 2bx - 2$

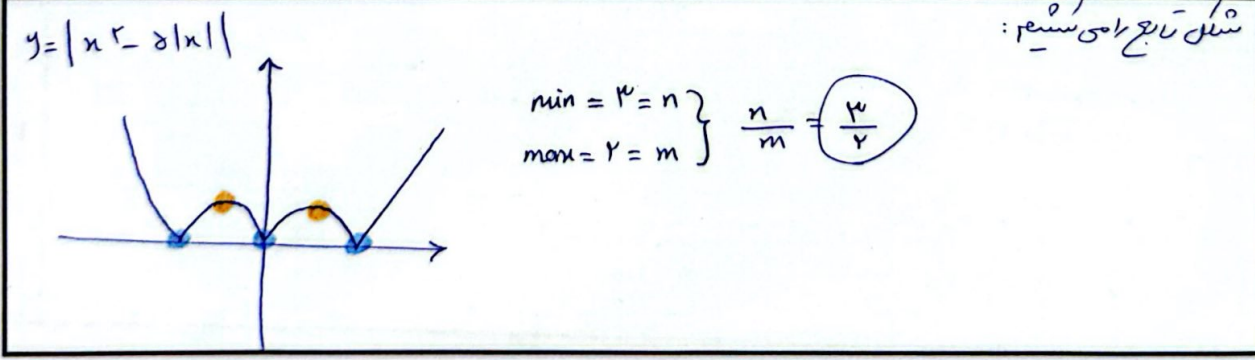
$f'(x) = 3x^2 + 2ax - 2b$

$f'(0) = 0 \Rightarrow b = 0 \rightarrow f(x) = x^3 + ax^2 - 2$

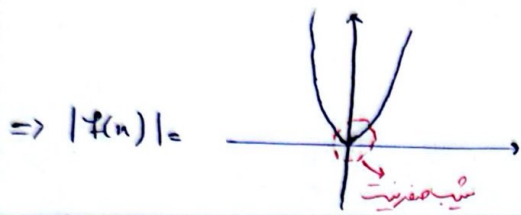
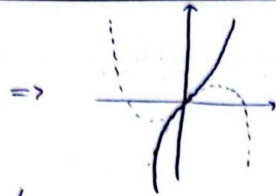
$f'(x) = 3x^2 + 2ax = 0 \Rightarrow x(3x + 2a) = 0 \Rightarrow x = 0, x = -\frac{2a}{3}$

$f(0) = -2$
 $f(-\frac{2a}{3}) = 0$

$\sqrt{(-\frac{2a}{3})^2 + 2} = \sqrt{2} \Rightarrow \frac{4a^2}{9} + 2 = 2 \Rightarrow a^2 = 0 \Rightarrow a = 0$



$$f(x) = \begin{cases} x(x+r) & x \geq 0 \\ x(-x+r) & x < 0 \end{cases}$$



دیکھتے ہیں کہ اس میں

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$$f(x) = \sqrt{x^r} |x-a| \quad [0, a] \quad f(x) = -\sqrt{x^r} (x-a)$$

$$f'(x) = \frac{-r x(x-a)}{\mu \sqrt{x^r}} - \sqrt{x^r} \Rightarrow f'(x) = \frac{-\mu x^r + \mu a x}{\mu \sqrt{x^r}}$$

$$-\mu \left(\frac{a}{x}\right) + \mu a = 0$$

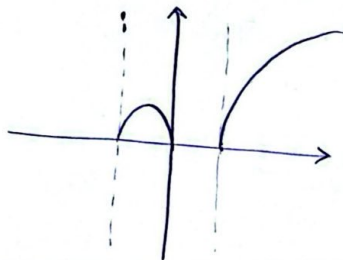
$$a = \frac{4}{x}$$

یہ اس لیے ہے کہ $f'(x)$ صفر ہو

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$$f(x) = \sqrt{x|x|-x} \rightarrow Df \Rightarrow -x|x|-x \geq 0 \rightarrow x \geq 1 \quad \text{یا} \quad -1 \leq x \leq 0$$

$$f(x) = \begin{cases} \sqrt{x^2-x} & x \geq 1 \\ -x^2-x & -1 \leq x \leq 0 \end{cases}$$



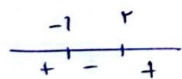
$$k=r \\ m=1 \\ n=0$$

$$\frac{k+m+n}{k-n} = \frac{r+0}{r-0} = 1$$

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$$y = \frac{mx+r}{x-l+m} \rightarrow y' = \frac{m(x-l+m) - (mx+r)}{(x-l+m)^2} \rightarrow y' = \frac{m^2 - m + r}{(x-l+m)^2}$$

$$m^2 - m + r < 0$$



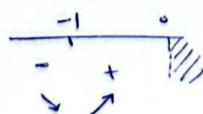
$$-1 < m < r$$

$$m \neq 0, 1$$

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$$f(x) = \frac{x}{1-|x|} \rightarrow Df \Rightarrow x|x| \neq 1 \quad (x \neq 1) \quad f(x) = \begin{cases} \frac{x}{1-x^2} & x \geq 0, x \neq 1 \\ \frac{x}{1+x^2} & x < 0 \end{cases}$$

$$\Rightarrow f'(x) = \begin{cases} \frac{x^2+1}{(1-x^2)^2} & x \geq 0, x \neq 1 \\ \frac{1-x^2}{(1+x^2)^2} & x < 0 \end{cases}$$



دیکھتے ہیں کہ $x=-1$

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