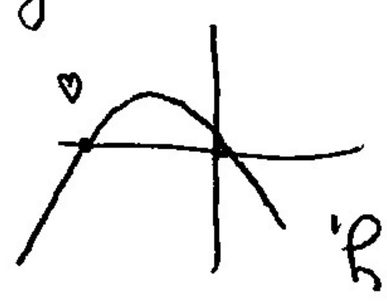
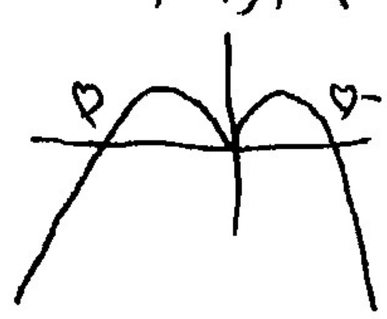
$y = x(x-a)$

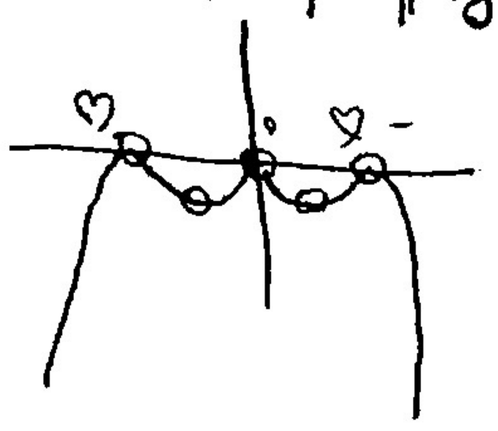




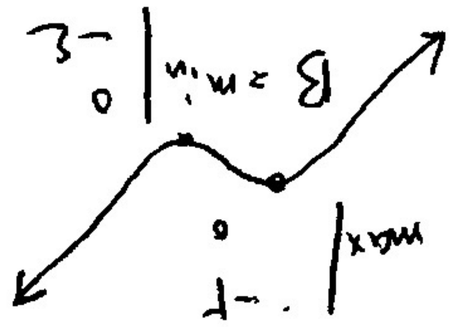
$m = 2$

$n = 2^m$

$\frac{n}{m} = \frac{2}{2}$



$-a$



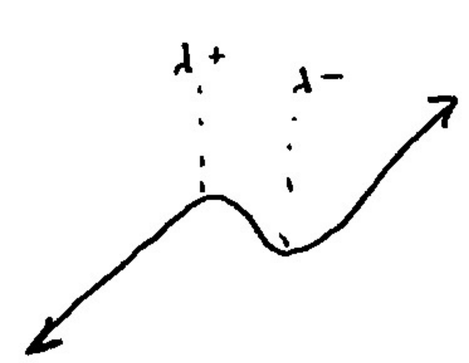
$y' = 2x^2 + 2ax - 2b = 2(x-0)(x+2) = 2x^2 + 4x$

$\rightarrow \begin{cases} a = 2 \\ b = 0 \end{cases}$ $f(0) = -\varepsilon$

$f(-2) = -4 + 8 - \varepsilon = 0$

$\overline{AB} = \sqrt{\varepsilon + 16} = \sqrt{20} = 2\sqrt{5}$

$-\varepsilon$



$y(+2) = 8$

$\rightarrow y = -4 - 2a + 2b + 8 = 0$

$y' = 3x^2 - 2a = 0 \rightarrow x = \pm\sqrt{\frac{2}{3}}$

x	$-\sqrt{\frac{2}{3}}$		$\sqrt{\frac{2}{3}}$	
y'	$+$	0	$-$	0
y	max ↗		↘ min	

-2

$\rightarrow x = \pm\sqrt{\frac{2}{3}}$

$y' = 3x^2 - 12 = 0$

$\rightarrow x = \pm 2$

x	-2		2	
y'	$+$	0	$-$	0
y	max ↗		↘ min	

$y(+2) = 8$

$\rightarrow y = -4 - 2a + 2b + 8 = 0$

$y(-2) = -4 + 2a + 2b + 8 = 0$

$\rightarrow a = 2$

$\rightarrow 2b = -8$

$b = -4$

$y = x^3 - 2x^2 - 4x + 8$

$y' = 3x^2 - 4x - 4 = 0$

$\rightarrow x = \frac{4 \pm \sqrt{16 + 48}}{6} = \frac{4 \pm 8}{6}$

$x = 2, -\frac{2}{3}$

x	$-\frac{2}{3}$		2	
y'	$+$	0	$-$	0
y	max ↗		↘ min	

$y(-\frac{2}{3}) = \frac{-8}{27} - \frac{8}{9} + \frac{8}{3} + 8 = \frac{-8 - 24 + 72 + 216}{27} = \frac{256}{27}$

$y(2) = 8 - 8 - 8 + 8 = 0$

$\rightarrow$ نقطة الحد الأدنى $(2, 0)$

$y' = 3x^2 - 2x - 1 = 0$

$\rightarrow x = \frac{2 \pm \sqrt{4 + 12}}{6} = \frac{2 \pm 4}{6}$

$x = 1, -\frac{1}{3}$

x	$-\frac{1}{3}$		1	
y'	$+$	0	$-$	0
y	max ↗		↘ min	

$y(-\frac{1}{3}) = \frac{-1}{27} - \frac{1}{9} + \frac{1}{3} + 1 = \frac{-1 - 3 + 9 + 27}{27} = \frac{32}{27}$

$y(1) = 1 - 1 - 1 + 1 = 0$

$\rightarrow$ نقطة الحد الأدنى $(1, 0)$

$y' = 3x^2 - 12x + 9 = 0$

$\rightarrow x = \frac{12 \pm \sqrt{144 - 108}}{6} = \frac{12 \pm 6}{6}$

$x = 3, 1$

x	1		3	
y'	$+$	0	$-$	0
y	max ↗		↘ min	

$y(1) = 4 - 12 + 9 + 1 = 2$

$y(3) = 27 - 36 + 27 + 1 = 19$

$\rightarrow$ نقطة الحد الأدنى $(3, 19)$

$y' = 3x^2 - 6x + 3 = 0$

$\rightarrow x = \frac{6 \pm \sqrt{36 - 36}}{6} = 1$

-1

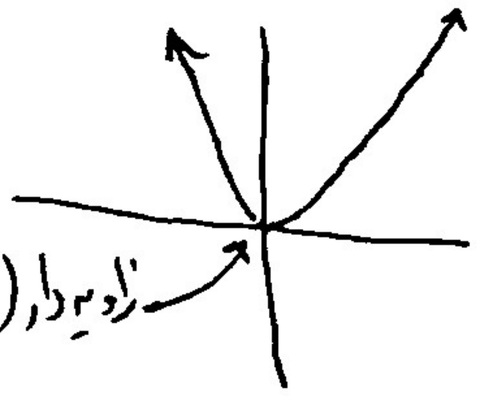
$f'(1) = \frac{f(1) - f(1)}{2} = \frac{1 - \frac{a}{2} - (1-a)}{2} = \frac{\frac{a}{2}}{2}$

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

۶ -

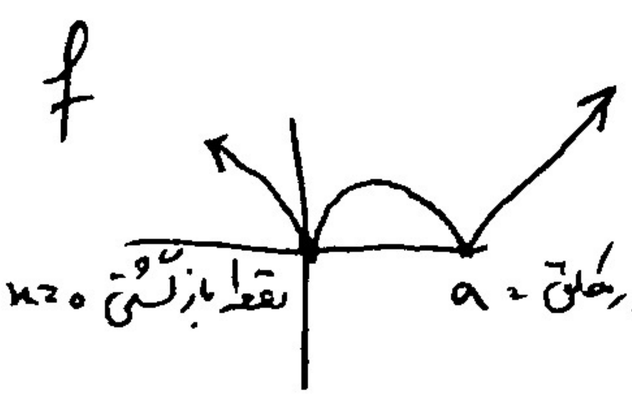
$$|f(x)| = |x(\ln|x|+2)| = \begin{cases} |x^2+2x| & x \geq 0 \\ |x^2-2x| & x < 0 \end{cases}$$

$y = |f(x)|$



یک نقطه بحرانی در $x=0$ دارد

۷ -



تابع در $0 \leq x \leq a$ $\longrightarrow f(x) = \sqrt[3]{x^2}(-x+a)$

$$f'(x) = \frac{2x(a-x)}{3\sqrt[3]{x^4}} + -\sqrt[3]{x^2} = 0$$

$$\longrightarrow \frac{2(a-x)}{3\sqrt[3]{x}} = \sqrt[3]{x^2} \longrightarrow 3x = 2a-2x \longrightarrow 5x = 2a \longrightarrow x = \frac{2a}{5}$$

$$f\left(\frac{a}{5}\right) = 1/8 = \sqrt[3]{\frac{4a^2}{25}}\left(\frac{3a}{5}\right) \longrightarrow \frac{a^5}{25} = a^5 \longrightarrow \boxed{a = 2/5}$$

۸ -

$$f(x) = \begin{cases} \sqrt{x^2-x} & x \geq 0 \\ \sqrt{-x^2-x} & x < 0 \end{cases} \qquad f'(x) = \begin{cases} \frac{2x-1}{2\sqrt{x^2-x}} & x > 0 \\ \frac{-2x-1}{2\sqrt{-x^2-x}} & x < 0 \end{cases}$$

$f'(x) = 0 \longrightarrow x = \frac{1}{2}$ ق بحرانی

$x = -\frac{1}{2}$ ق بحرانی

$x = 0$ بحرانی مشتق‌پذیر

$x = -1$ بحرانی مشتق‌پذیر

$x = 1$ بحرانی مشتق‌پذیر

۹ -

$$\begin{cases} m = 1 \\ n = 0 \\ k = 4 \end{cases} \qquad \frac{km+n}{k-n} = 1$$

$I: ad-bc < 0 \longrightarrow m^2 - m - 2 < 0 \quad (m-2)(m+1) < 0 \quad m \in (-1, 2)$

$II: 1-m \leq 1 \longrightarrow 0 \leq m$ $\quad I \cap II \Rightarrow m \in [0, 2) \longrightarrow m = 0, 1$

$y = m$ ارتفاع چون گیر نقطا

$x = 1-m$

به ازای دو مقدار صحیح

۱۰ -

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

$f'(x) = 0 \longrightarrow x = \pm 1$ (غ ق -1 ق $+1$)

تابع از $-\infty$ تا $+\infty$ صعودی است.

زیرا صعودی راست و چپ صفر وجود دارد

تابع در $x = -1$ نقطه بحرانی دارد