① $f(x)=1-\frac{a}{x}$ $[1,4]$ — نزدیک نزدیک

$f(1)=-a$ $\quad f(4)=1-\frac{a}{4}$ $\quad m=\frac{f(4)-f(1)}{3}=\frac{-\frac{a}{4}+a}{3}=\frac{2a}{6}=\frac{a}{3}$

$f'(x)=$ مشتق $\frac{a}{x^2}=\frac{a}{3} \rightarrow x=\pm\sqrt{3}$

② $y=2ax^2-5x+18a$ $\quad y=x$ $\quad 4ax-5=1$ $\quad 4ax=6$ $\quad ax=\frac{3}{2}$ $\quad$ مماس $\frac{3}{2}x$

$y'=4ax-5$ $\quad y'=1$

$y=2(ax)x^3-5x+18a=x$ $\quad 3x^3-5x+18a=x$ $\quad 3x=18a$ $\quad x=6a$

$2\times 6a^2=\frac{3}{2}$ $\quad a^2=\frac{1}{16} \rightarrow a=\pm\frac{1}{4}$ $\quad x=\pm 3$ $\quad x=-3,\ a=-\frac{1}{4}$

③ $y=x^3-12x+2 \rightarrow y''=3x^2-12=0 \rightarrow x=\pm 2$

$8+2-24$

	-2		2	
$f'(x)$	$+$	0	$-$	0
$f(x)$	↗	18	↘	-14

$y=-14$

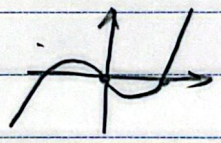
④ $y=x^3+ax^2-2bx-4 \rightarrow y'=3x^2+2ax-2b \xrightarrow[\text{اکسترمم}]{\text{مشتق تابع}} -2,0$ $\quad -2b=0 \rightarrow b=0$

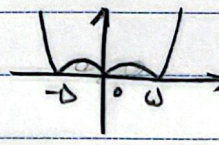
$y'=12-4a-8=0 \rightarrow \boxed{a=1} \rightarrow y=x^3+4x^2-4$ $\quad f(0)=-4$ $\quad f(-2)=0$

$-8+12-4$

$\sqrt{4+16}=\boxed{2\sqrt{5}}$

⑤ $f(x)=\begin{cases}x^2-5x & x\geq 0\\ x^2+5x & x\leq 0\end{cases}$ $\quad x(x+5)$

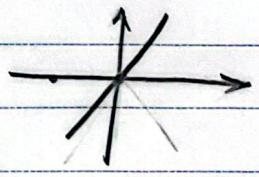


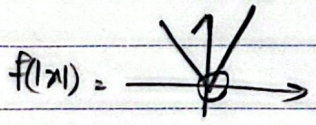


-5 $\quad 0$ $\quad 5$

$f(x)_{max}=0$ $\quad f(x)_{min}=-\frac{25}{4}$ $\quad \frac{n}{m}=\frac{1}{4}$

⑥ $f(x)=x(|x|+3)$ $\begin{cases}x^2+3x & x\geq 0 \quad x(x+3)\\ -x^2+3x & x\leq 0 \quad x(3-x)\end{cases}$



$f(|x|)=$ 

$x=0$ نقطه بحرانی

⑦ $f(x)=\sqrt[3]{x^2}\,|x-a| \xrightarrow{x\in a} -\sqrt[3]{x^2}(x-a)=y \rightarrow y=(x^{\frac{2}{3}})(a-x)=y$

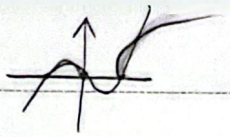
$y'=(\frac{2}{3}x^{-\frac{1}{3}})(a-x)+(-1)(x^{\frac{2}{3}})=0$

$\frac{2}{3}ax^{-\frac{1}{3}}-\frac{2}{3}x^{\frac{2}{3}}-x^{\frac{2}{3}}=0$

$\frac{1}{3}x^{-\frac{1}{3}}(2a-2x-3x)=0$ $\quad 2a=5x$ $\quad$ طول $=a=1.5$ $\quad a=\frac{5}{2}\times\sqrt[3]{3^2}=\frac{5\sqrt[3]{9}}{2}$

$(x^{\frac{2}{3}})(\frac{1}{2}x)=\frac{3}{2}$ $\quad \frac{1}{2}x^{\frac{5}{3}}=\frac{3}{2}$ $\quad \boxed{x=\sqrt[5]{3^3}}$

⑧ $f(x)=\sqrt{x|x|-x}$ $\longrightarrow$ $h(x)=x|x|-x$ $h(x)=x(|x|-1)$



$D_f=[-1,0]\cup[1,+\infty)$

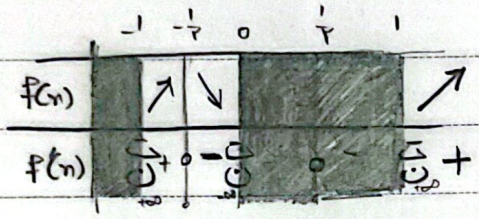
$f(x)\longrightarrow \sqrt{x^2-x}$ $\quad 1\le x$

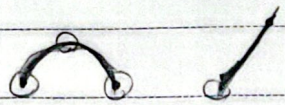
$\hookrightarrow \sqrt{-x^2-x}$ $\quad -1\le x\le 0$

$\longrightarrow f'(x)=\longrightarrow \dfrac{2x-1}{2\sqrt{x^2-x}}$ $\quad 1<x$ $\quad x=\boxed{\frac{1}{2},0,1}$ ریشه

$\hookrightarrow \dfrac{-2x-1}{2\sqrt{-x^2-x}}$ $\quad -1<x<0$ $\quad \boxed{-\frac{1}{2}}$ ریشه

ساری می‌توان از جدول مرز بازه‌ها نیز را هم می‌نوشت.



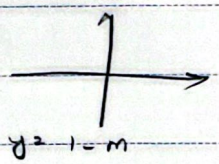


$x=k$ نقطه بحرانی

m نسبی $Max=①$ $\quad \frac{f_{+0}}{f_{-0}}=①$

n نسبی $Min=0$

⑨ $y=\dfrac{mx+2}{x(-1+m)}$ $\quad x=k$



$y'=\dfrac{-m+m^2-2}{(x-1+m)^2}$

⑩ $f(x)=\dfrac{x}{1-x|x|}$ $\longrightarrow$ $\dfrac{x}{1-x^2}$ $\quad x\ge 0$; $\dfrac{x}{1+x^2}$ $\quad x<0$

$f'(x)=$ $\dfrac{(1-x^2)-(-2x)(x)}{(1-x^2)^2}$ $\quad x\ge 0$; $\dfrac{(1+x^2)-(2x)(x)}{(1+x^2)^2}$ $\quad x<0$

$D_f=R-\{\pm 1\}$

$1-x^2+2x^2=0$ $\longrightarrow$ بحرانی

$\dfrac{1+x^2-2x^2}{2}=0$ $\quad 1-x^2=0$ $\quad x=\pm 1$ $\longrightarrow$ نقطه مشتق جدا ندارد $\longrightarrow$ فقط ① نقطه بحرانی دارد