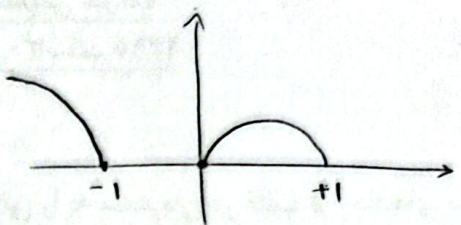


$f(x) = x|x^2 - 1|$
 $\hookrightarrow x = \sqrt{x}, -\sqrt{x}$
 $\rightarrow f(x) = x(x^2 - 1) = x^3 - x^2 \xrightarrow{f'(x)=0} f'(x) = 3x^2 - 2x = 0$
 $x^2 - 1 \rightarrow x = \pm 1$
 $f(-1) = -1 \times |1 - 1| = 0$
 $f(1) = 1 \times |1 - 1| = 0$
 $f(\sqrt{x}) = \sqrt{x} \times |x - 1| = 0$

14 A - دو درجه مس / دو درجه اول / دو درجه اول
 $f(x) = \sqrt{x(1-|x|)}$
 $\rightarrow x \leq 1 \rightarrow \sqrt{x - x^2}$
 $\hookrightarrow x \leq 0 \rightarrow \sqrt{x + x^2}$

 $\min = 0$
 $\max = 1 \Rightarrow f(1) = 0$
 $f(0) = 1$

$A(-b/a) \rightarrow y = -x^2 + 3ax + b$
 $\rightarrow y' = 2b, y = 1$
 $\Rightarrow 1 + 3a + b = 1 \rightarrow b = -3a$
 $\Rightarrow y' = -2x^2 + 6ax - 1 = 0 \rightarrow x = \frac{3a}{2}$
 $\Rightarrow b = \frac{9}{4}, a = -\frac{1}{4} \Rightarrow \frac{b}{a} = -\frac{9}{1} = -9$

$f(x) = \sqrt{x} + \sqrt{a-x}$
 $\rightarrow x \geq 0$
 $\rightarrow x \leq a$
 $\Rightarrow D_f = [0, a]$
 $f'(x) = \frac{1}{2\sqrt{x}} - \frac{1}{2\sqrt{a-x}} = 0 \Rightarrow \sqrt{x} = \sqrt{a-x} \Rightarrow x = a/2$
 $\Rightarrow f(0) = \sqrt{a}$
 $\Rightarrow f(a/4) = \sqrt{a/4} + \sqrt{3a/4} = \sqrt{a} \Rightarrow y_{\min} = \sqrt{a/4}$
 $\Rightarrow f(a/4) = \sqrt{a/4}$
 $\Rightarrow y_{\max} = \sqrt{3a/4}$
 $\Rightarrow \sqrt{a/4} \times \sqrt{3a/4} = \sqrt{3a^2/16} \rightarrow a = 4 \rightarrow [4, 4]$

$\frac{-b}{2a} = -\frac{1}{2} = -\frac{1}{2}$
 $-\frac{a-1}{a+1} = -\frac{1}{2} \rightarrow 2a - 1 = a + 1 \rightarrow a = 2$
 $y = \frac{2x+1}{x+1} = 0 \rightarrow x = -\frac{1}{2}$

$f(x) = \frac{x^2}{x^2 - 1}$
 $x = \pm 1$ ریشه ها در مخرج، استریم
 $x = 0$ هم ریشه زوج تابع، استریم آن است
 \Rightarrow استریم داریم

$\frac{dx}{x} = \frac{bx^2 + v}{x^2 + ax + 1}$
 $\rightarrow \frac{b}{x} = 1 \rightarrow b = 1$
 $x = -\frac{1}{2} \rightarrow f(\frac{1}{2}) + a(-\frac{1}{2}) + 1 = 0$
 $\Rightarrow \frac{b}{a} = \frac{1}{2} = \frac{1}{2}$

$y(0) = d = 0 \rightarrow d = 0$
 $y'(0) = 3ax^2 + 2bx + c = 0 \rightarrow c = 0$
 $y(1) = a + b = 1$
 $y'(1) = 3a + 2b = 0$
 $\Rightarrow a = -\frac{2}{3}, b = \frac{5}{3}$
 $ab = -\frac{10}{9}$

$D_{f(x)} \{ \pm \sqrt{x} \}$

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

1

$\Rightarrow \frac{2x(x^2-1)(x^2-2)}{(x^2-2)^2}$

$2x=0 \rightarrow x=0 \quad x^2-2=0 \rightarrow x=\pm\sqrt{2}$

$x^2-1=0 \rightarrow x=\pm 1 \quad x^2-2=0 \rightarrow x=\pm\sqrt{2}$

	-2	$-\sqrt{2}$	$-\sqrt{2}$	0	1	$\sqrt{2}$	$\sqrt{2}$	2
$f'(x)$	-	0	+	+	0	-	-	+
$f(x)$	\searrow	\nearrow	\nearrow	\searrow	\nearrow	\searrow	\searrow	\nearrow

تابع در بازه $(-\infty, -\sqrt{2})$ نزولی است.



10

$D_{f(x)} \{ x^2 \}$

9

$f'(x) = \frac{(f(x^3))(x^3-1) - (f(x^2))x^2}{(x^3-1)^2}$

$\Rightarrow \frac{x^3(x^3-1)(x^3-1) - (x^3)(x^2)}{(x^3-1)^2}$

$\rightarrow x^3=0 \rightarrow x=0$

$x^3-1=0 \rightarrow x^3-1=0 \rightarrow x^3-1=0$

	0	1	$\sqrt[3]{2}$	$\sqrt[3]{2}$
$f'(x)$	+	0	-	-
$f(x)$	\nearrow	\searrow	\searrow	\nearrow

2

تابع در بازه $(0, 1)$ نزولی است.

تابع در بازه $(1, \sqrt[3]{2})$ نزولی است.

تابع در بازه $(\sqrt[3]{2}, \infty)$ صعودی است.

$2x^2 - 4x + 3 = 0 \rightarrow 2x^2 - 4x + 3 = 0 \rightarrow \{x=0\}$

$\rightarrow 2x^2 - 4x + 3 = 0 \xrightarrow{x^2=t} t^2 - 2t + 3 = 0 \rightarrow t = \frac{2 \pm \sqrt{4-12}}{2} = 1 \pm \sqrt{2}$

x	$-\sqrt{2}$	$-\sqrt{2}$	0	$\sqrt{2}$	$\sqrt{2}$
y'	-	0	+	0	-

در بازه $(-\infty, -\sqrt{2})$ نزولی است.