نام و نام خانوادگی: علی ربانی «ریاضی تعالی ۲» کلید شماره: ۵ کلاس یازدهم A

۱-

$f(x)=(\frac{1}{2})^{x-2}-1$ $\sqrt{x^2 f(x+1)}$ $D_f=[0,1]$

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

	0		1	
−	0	+	0	−

	1	
+	0	−
2^0-1		$(\frac{1}{2})^0-1$

۲-

$f(x)=\sqrt{x-|x-2|}$ $f(-x)=\sqrt{-x+|2-x|}$ $D_f=(-\infty,1]$

	1		2	
$-2x+2$	0	$-2x+2$		$-x+x-2$
+		−	-2	-2
			−	−

۳-

$y=\sqrt{\frac{x-1}{f(x)}}$ → با توجه به شکل داریم: $f(x)\neq 0 \Rightarrow x\neq\{-4,2,3\}$

−5		−4		1		2		3
	−		+	0	−		+	

$D_f=(-4,1]\cup(2,3)$

۴-

$y_1=\frac{1}{9x^4-7x^2-4x-3}$ $y_2=\frac{1}{3x^2+ax+b}$

$9x^4-7x^2-4x-3=9x^4-6x^2-x^2-4x-4+1=-(x^2+4x+4)=-(x+2)^2+9x^4-6x^2+1$

$(3x^2-1)^2$

$=(3x^2-1)^2-(x+2)^2=(3x^2-1-x-2)(3x^2-1+x+2)$

$3x^2-x-3=3x^2+ax+b$ $(3x^2-x-3)(3x^2+x+1)\to\Delta<0\to$ ریشه ندارد

$a=-1$ $b=-3$ $\Delta=1+36=37$ ✓

$\Rightarrow\sqrt{-(a+b)}=\sqrt{-(-4)}=\boxed{2}$

۵-

$f(x)=x^3+x$

$D_f=[-2,0)\cup[2,+\infty)$

$y=\sqrt{f(x)-f(\frac{4}{x})}$ ریشه ها: -2 و 2 ← $(\frac{x^2-4}{x})(\frac{x^4+16+5x^2}{x^2})$

همواره مثبت

$y=\sqrt{x^3+x-(\frac{4}{x})^3-\frac{4}{x}}$ →

	−2		0		2	
−	0	+		−	0	+

$(x^2+\frac{16}{x^2}+5)$

$x^3+x-(\frac{4}{x})^3-\frac{4}{x}\geq 0$ ریشه ها: -2 و 2

$x^3-(\frac{4}{x})^3+(x-\frac{4}{x})\Rightarrow(x-\frac{4}{x})(x^2+4+\frac{16}{x^2})+(x-\frac{4}{x})\Rightarrow(x-\frac{4}{x})(x^2+4+\frac{16}{x^2}+1)$

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۶-

$f(x^3+x) = 2x^3-1 \qquad 7+1 = \boxed{8}$

$f(2) = f(1^3+1) = 2(1)^3-1 = \boxed{1}$

$f(10) = f(2^3+2) = 2(2)^3-1 = \boxed{7}$

۷-

$g(x) = x^3+9x^2+27x+27-27 = (x+3)^3-27 \qquad f(x) = x^3-6x^2+12x+8-8 = (x-2)^3+8$

$27+7$

$$\frac{g(\sqrt[3]{7}-3)}{f(\sqrt[3]{2}+2)} = \frac{(\sqrt[3]{7}\cancel{-3+3})^3-27}{(\sqrt[3]{2}\cancel{+2-2})^3+8} = \frac{-20}{10} = \boxed{-2}$$

$8+2$

۸-

$x \geq 4 \qquad g(x) = \sqrt{x-4\sqrt{x-4}} \;,\; f(x) = \sqrt{x+4\sqrt{x-4}}$

$$\Big(\underbrace{\sqrt{x-4\sqrt{x-4}}+\sqrt{x+4\sqrt{x-4}}}_{a}\Big)^2 = x\cancel{-4\sqrt{x-4}}+x\cancel{+4\sqrt{x-4}}+2\sqrt{x-4\sqrt{x-4}}\sqrt{x+4\sqrt{x-4}}$$

$$= 2x+2\sqrt{x^2-(4\sqrt{x-4})^2} = 2\sqrt{x^2-16x+64} = 2x+2\sqrt{(x-8)^2} = 2x+2x-16$$

$$= (a)^2 = 4x-16 \Rightarrow a = \sqrt{\underbrace{4x-16}_{4(x-4)}} = 2\sqrt{x-4}$$

$\underset{0}{a}+\underset{2}{b}\sqrt{x+\underset{-4}{c}} \qquad \frac{a+b}{c} = \frac{2}{-4} = \boxed{-\frac{1}{2}}$

۹-

$g(x) = \{(2,1)(1,0)(3,5)(0,4)\} \qquad f(x) = \frac{x+2}{x^2-4x+3}$

$f(x) = \{(2,-4)(1,\cancel{\div 0})(3,\cancel{\div 0})(0,\frac{2}{3})\}$

$\frac{g}{f} = \frac{1}{-4} \;,\; \frac{4}{\frac{2}{3}} = 6 \Rightarrow \boxed{-\frac{1}{4}, 6} \Rightarrow \{(0,6)(2,\frac{1}{-4})\}$

۱۰-

$f(x) = \{(1,2)(3,-1)(4,2)(-1,6)\}$

$g(x) = \{(-2,3)(1,-1)(3,2)(-1,0)\}$

الف) $f(2x) = \{(\frac{1}{2},2)(\frac{3}{2},-1)(2,2)(-\frac{1}{2},6)\}$

ب) $f(x^2) = \{(\pm 1,2)(\pm\sqrt{3},-1)(\pm 2,2)\underset{\text{غ ق}}{\cancel{(-1,6)}}\}$ → در دامنه [illegible] تعریف نمی‌شود

ج) $2g^2(x)+1 \Rightarrow g^2 = \{(-2,9)(1,1)(3,4)(-1,0)\} \times 2 \rightarrow \{(-2,18)(1,2)(3,8)(-1,0)\} + 1$

$\Rightarrow \boxed{\{(-2,19)(1,3)(3,9)(-1,1)\}}$

د) $-\frac{2f}{g} = \{(1,\frac{4}{-1})(-1,\underset{\text{غ ق}}{\frac{12}{0}})(3,\frac{-4}{2})\} = \{(1,-4)(3,-1)\}$

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