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1.

$$f(x) = \begin{cases} x^2+2x & ; x \geq a \\ ax-4 & x \leq a \end{cases}$$

$$a^2+2a = a^2-4 \qquad 2a=-4 \qquad \boxed{a=-2}$$

2.

$$f(x) = \frac{x^2+a}{2x-b} \qquad g(x) = 2x+b \qquad f(1)=?$$

$$\frac{2^2+a}{4-b} = \quad 4+b=3 \quad \boxed{b=-1} \qquad \frac{4+a}{\underbrace{4-(-1)}_{5}} = 3 \qquad 15 = 4+a \quad \boxed{a=11}$$

$$f(1) = \frac{1^2+11}{2\times1-(-1)} = \frac{12}{3} = \boxed{4}$$

3.

$$f(x) = \frac{4x+1}{2x^2+ax+b} \quad \text{دامنه}: \mathbb{R}-\{-1,4\} \qquad f(1)=?$$

$$2(x+1)(x-4) = (2x+2)(x-4) = 2x^2-8x+2x-8 = 2x^2-6x-8$$

$$2x^2+ax+b = 2x^2-6x-8 \rightarrow \begin{array}{l} a=-6 \\ b=-8 \end{array}$$

$$f(1) = \frac{4+1}{2+(-6)+(-8)} = \boxed{\frac{5}{-12}}$$

4.

$$f(x) = \frac{x^3-\sqrt{4}}{-4x^2+ax+b} \quad \text{دامنه}: \mathbb{R}-\{-1\} \qquad a+b=?$$

$$-4(x+1)^2 = -4(x^2+1+2x) = -4x^2-4-8x \qquad \left.\begin{array}{l} b=-4 \\ a=-8 \end{array}\right\} a+b = \boxed{-12}$$

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$f(x)=\dfrac{2x}{(x-1)(\underbrace{x^2+mx+1})}$ دامنه : $\mathbb{R}-\{1\}$

$\to$ ریشه ندارد $\to \Delta<0$

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$m^2-4<0 \qquad m^2<4 \to -2<m<2 \Longrightarrow \boxed{[-2,2)}$

$\Delta=0 \to m=-2$

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$f(x)=\sqrt{4-\dfrac{1}{x^2}}$

$-\frac{1}{2} \quad 0 \quad \frac{1}{2}$

$+ \ | \ - \ | \ - \ | \ +$

$4-\dfrac{1}{x^2}\geq 0 \qquad \dfrac{+1}{x^2}\leq 4$

$\dfrac{1}{x^2}-4\leq 0 \to \dfrac{-4x^2+1}{x^2}\leq 0 \quad \begin{cases} -\frac{1}{2} \\ \frac{1}{2} \end{cases}$ صفر $\longrightarrow (-\infty,-\frac{1}{2}]\cup[\frac{1}{2},+\infty)$

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$f(x)=\sqrt{mx^2+2mx+1}$ دامنه : $\mathbb{R}$

$a>0\to m>0$

$\Delta<0$

$\underbrace{m}_{a}x^2+\underbrace{2m}_{b}x+\underbrace{1}_{c}\geq 0$

$4m^2-4m<0 \to m(4m-4)$ $\quad 0 \quad 1$ $\quad + \ 0 \ - \ 1 \ +$ $\qquad m=[0,1]$ ۳

$m=0\to 1$

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$f(x)\begin{cases}\dfrac{4x^2-1}{2x-1}, & x\neq a\ \frac{1}{2}\\ \underbrace{4a+k}_{2+k}, & x=\frac{1}{2}\end{cases} \qquad g(x)=2x+1$

$\underset{\frac{1}{2}}{a}+\underset{0}{k}=?=\boxed{\frac{1}{2}}$

$2x-1\neq 0$

$2x\neq 1$

$x\neq \frac{1}{2}$

$2\times\frac{1}{2}+1=4\times\frac{1}{2}+k$

$2=2+k\longrightarrow k=0$

۹ـ

$f(x)\begin{cases}\dfrac{9x^2-4}{3x+2} & x\neq -\frac{2}{3}\\ 3ax+2 & x=-\frac{2}{3}\end{cases} \qquad g(x)=3x+b$ ۳

$a-b=?$

$f(x)=g(x)\longrightarrow \dfrac{9x^2-4}{3x+2}=3x+b\to 9x^2-4=(3x+b)(3x+2)\longrightarrow\boxed{b=-2}$

$3\times\frac{-2}{3}\times a+2=3\times\frac{-2}{3}-2$ $\qquad a-b=3-(-2)=\boxed{5}$

$-2a+2=-2-2=-4$

$-2a=-6\longrightarrow\boxed{a=3}$

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$$f(x) = \begin{cases} \dfrac{x^{۲} - ۴}{x - ۲} , & x \neq ۲ \\ ۲a^{۲} + ax , & x = ۲ \end{cases}$$

$$g(x) = x + ۲$$

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$$f(۲) = g(۲) \qquad ۲a^{۲} + ۲a = \cancel{x}^{۲} + ۲ = ۴$$

$$۲a(a + ۱) = ۴ \longrightarrow a = ۱ , -۲$$