

$$f(x) = \begin{cases} x-1 & x \geq 1 \\ x+2 & x < 1 \end{cases}$$

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$$\begin{aligned} f(x) \geq x-1 &\rightarrow x-1 \geq x-1 & x \geq 0 &\rightarrow x \geq 1 \\ & & &\rightarrow x \geq \frac{1}{2} \\ f(x) \geq x-1 &\rightarrow x+2 \geq x-1 & x < 1 &\rightarrow x \geq \frac{1}{2} \end{aligned}$$

$$D = \left[-\frac{1}{2}, +\infty\right)$$

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

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$$D = \mathbb{R} - \left\{-\frac{1}{2}\right\}$$

$$f(x) = \begin{cases} \frac{x^2 + 1}{x^2 + 1} = \frac{x(x^2 + 1) + 1(x^2 + 1)}{x^2 + 1} = x + 1 = g(x) = x + 1 \\ \frac{ax + b}{x + 1} \rightarrow \begin{cases} x=1 \rightarrow \frac{a+b}{2} = g(1) = 2 \\ x=-1 \rightarrow \frac{-a+b}{-1+1} = g(-1) = 1 \end{cases} \end{cases}$$

$$\Rightarrow -b = -1 \quad b = 1 \quad b + 1 = 2 + 1 = 3$$

$$f(x) = g(x) = \frac{x+1}{x-1} = \frac{x^2 + 1}{x^2 + 1} = \frac{(x+1)(x-1)}{(x-1)(x-1)} \quad D_f = D_g$$

$$D_f = \mathbb{R} - \{1\} = \mathbb{R} - \{1\} \Rightarrow C = 1 \Rightarrow g(x) = \frac{x^2 + 1}{(x-1)^2} = \frac{x^2 + 1}{x^2 - 2x + 1}$$

$$a = 1 \quad b = 1 \Rightarrow a + b + C = 1 + 1 + 1 = 3$$

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

$$= ((x-1)^2 - (1-x)^2) = x(x-1+x-1)(x-1-x-1) = x \times 2x \times (-2) = -4x^2$$

$$\begin{aligned} 1-2x &= -1 \quad x=1 \Rightarrow f(-1) = 1 \\ 1-2x &= 1 \quad x=-1 \Rightarrow f(1) = 1 \end{aligned} \rightarrow f(-1) + f(1) = 2$$

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$$x + \sqrt{x} = 7 \quad \sqrt{x} = 7 - x \quad x = (7-x)^2 = 49 - 14x + x^2 \quad x^2 - 15x + 49 = 0 \quad (x-1)(x-9) = 0 \quad \rightarrow x=1 \text{ or } x=9$$

$$f(9) = f' + f \times f = 2 \times 9 + 12 = 29 \checkmark$$

$$f(x-1) = (x-1)^2 + (x-1) \quad f(1-x) = (1-x)^2 + (1-x)$$

$$(x-1)^2 + (x-1) - (1-x)^2 - (1-x) = 0 \checkmark$$

$$f(x) = \sqrt{x-a} + k-1$$

$$x \geq a$$

$$x \geq \frac{a}{f}$$

$$g(x) = \sqrt{b-x} + k$$

$$x \leq b$$

$$x \leq \frac{b}{f}$$

$$\frac{a}{f} = 1 \quad a = f \checkmark \rightarrow f(x) = \sqrt{x-f} + k-1$$

$$\frac{b}{f} = 1 \quad b = f \checkmark \rightarrow g(x) = \sqrt{f-x} + k$$

$$f(1) - g(1) = 2k-2 - k = k \quad k = 1 \checkmark$$

$$\frac{a-b}{f} = k \quad f = 2+1 = 3 \checkmark$$

$$D_f = [-\infty, m]$$

$$D_g = [-1, +\infty]$$

$$\rightarrow D_f \cap D_g = [-1, \sqrt{2}] \Rightarrow m = \sqrt{2} \checkmark$$

$$f(x) - g(x) = \sqrt{x-2} + 1 - \sqrt{1-x} = 2\sqrt{x} \quad 2-2\sqrt{x}+1 = 2\sqrt{x} \quad x = 1 \checkmark$$

$$m = 1 \quad 1\sqrt{2-2} + 1 = 1\sqrt{1} + 1 \checkmark$$