

$$f(x) = \begin{cases} (x+1)(x+2) & x \geq 1 \\ 3x+2x & x < 1 \end{cases} \rightarrow 2f(1) = f(1-2) + a = 2((1+1)(1)) = 2a + 2(-2) + a \Rightarrow a = -1$$

$$a = \frac{-18}{10} = -\frac{9}{5}$$

$$f(x) = \sqrt{x} + \frac{1}{\sqrt{x}} + 2 \quad \left\{ \begin{aligned} f(2\sqrt{3}) + f(2+\sqrt{3}) &= \sqrt{2\sqrt{3}} + \frac{1}{\sqrt{2\sqrt{3}}} + 2 + \sqrt{2+\sqrt{3}} + \frac{1}{\sqrt{2+\sqrt{3}}} + 2 = \\ &= \frac{(\sqrt{2\sqrt{3}}+1)(\sqrt{2+\sqrt{3}}+1)}{\sqrt{2\sqrt{3}}\sqrt{2+\sqrt{3}}} + 4 = \frac{(2-\sqrt{3})(2+\sqrt{3}) + \sqrt{2+\sqrt{3}} + (2+\sqrt{3})(\sqrt{2-\sqrt{3}}) + \sqrt{2-\sqrt{3}}}{\sqrt{(2-\sqrt{3})(2+\sqrt{3})}} + 4 = \frac{1}{\sqrt{(2-\sqrt{3})(2+\sqrt{3})}} + 4 = \frac{1}{\sqrt{4-3}} + 4 = 1 + 4 = 5 \end{aligned} \right.$$

$$+ \sqrt{2-\sqrt{3}}(\sqrt{2+\sqrt{3}}) + 4 = \sqrt{(2+\sqrt{3})(2-\sqrt{3})} + \sqrt{(2-\sqrt{3})(2+\sqrt{3})} + 4 = \sqrt{(2+\sqrt{3})(2-\sqrt{3})} + \sqrt{(2-\sqrt{3})(2+\sqrt{3})} + 4 = 2\sqrt{4-3} + 4 = 2 + 4 = 6$$

$$2f(x) - 3f(-x) = 4x^2 - x \quad \left\{ \begin{aligned} 2f(1) - 3f(-1) &= 4x^2 - x \Rightarrow 4f(1) - 6f(-1) = 1x^2 - 2x \\ 2f(-1) - 3f(1) &= 4x^2 + x \Rightarrow 4f(-1) - 6f(1) = 1x^2 + 2x \end{aligned} \right. \Rightarrow -4f(1) = 2x^2 + 2x \Rightarrow f(1) = -\frac{x^2 + x}{2}$$

$$(x+2)f(x) - 3xf(x+2) = 4x^2 - mx + 3m-1 \quad \left\{ \begin{aligned} x=0 &\Rightarrow (0+2)f(0) + 0 = 3m-1 \Rightarrow 2f(0) = 3m-1 \\ x=1 &\Rightarrow (1+2)f(1) - 3f(1+2) = 4 - m + 3m-1 = 4 + 2m + 3m-1 \end{aligned} \right. \Rightarrow 18-4m=0 \Rightarrow m=4\frac{1}{2}$$

$$2f(0) = 3m-1 \Rightarrow 2f(0) = \frac{3m}{2} \Rightarrow f(0) = \frac{3m}{4} \Rightarrow (-2+2)f(-2) + 6f(0) = 4 + 2m + 3m-1 \Rightarrow m = \frac{4}{5}$$

$$f(x) + f\left(\frac{1}{x}\right) = \frac{3x^2 - 12x + 3}{x} \Rightarrow ax + b + \frac{a}{x} + b = \frac{3x^2 - 12x + 3}{x} \Rightarrow ax^2 + 2bx + a + \frac{3}{x} - 12 + \frac{3}{x} = \frac{3x^2 - 12x + 3}{x} \Rightarrow a = 3, b = -9$$

$$\Rightarrow f(x) = 3x - 9 \Rightarrow -3 \cdot 9 = -9 = f(-1)$$

$$f(x) = (x-1)\sqrt{1-x} \Rightarrow Df \Rightarrow x \leq 1 \quad \left\{ \begin{aligned} f(x) &= \sqrt{(1-x)(1-x)} = -\sqrt{(1-x)^2} \\ g(x) &= -\sqrt{(1-x)^2} \Rightarrow Dg \Rightarrow (1-x)^2 \geq 0 \Rightarrow x \leq 1 \end{aligned} \right. \Rightarrow Df = Dg$$

چون در نقطه ۱، مشتق تابع f و g برابر است، پس $f(x) = g(x)$

$$f(0) = g(0) = -1, f(-1) = g(-1) = -2\sqrt{2}, f(-3) = g(-3) = -1 \dots$$

$$f(x) = x\sqrt{x} \Rightarrow Df \Rightarrow x \geq 0 \quad \left\{ \begin{aligned} f(x) &= \sqrt{x(x^2)} = \sqrt{x^3} \\ g(x) &= \sqrt{x^3} = Dg \Rightarrow x^3 \geq 0 \Rightarrow x \geq 0 \end{aligned} \right. \Rightarrow Df = Dg$$

چون در هر نقطه، مشتق تابع f و g برابر است، پس $f(x) = g(x)$

$$f(0) = g(0) = 0, f(4) = g(4) = 8$$

$$f(x) = [\sqrt{x} - \sqrt{x}] = Df \Rightarrow x \geq 0 \quad \left\{ \begin{aligned} f(x) &= [\sqrt{x}] - [\sqrt{x}] = 0 = Df = 0 \\ g(x) &= \sqrt{x-1} \Rightarrow Dg \Rightarrow x-1 \geq 0 \Rightarrow x \geq 1 \end{aligned} \right. \Rightarrow Df = Dg$$

چون در هیچ نقطه‌ای، مشتق تابع f و g برابر نیست، پس $f(x) \neq g(x)$

$$g(x) = \sqrt{x-1} \Rightarrow Dg = 0$$

چون در هیچ نقطه‌ای، مشتق تابع f و g برابر نیست، پس $f(x) \neq g(x)$

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$$f = \{(1, 2), (2, 3), (3, 1), (0, 0)\} \quad g = \{(-1, 1), (1, 1), (2, 3), (3, \infty), (0, 2), (\sqrt{2}, 1)\} \quad .9$$

$$\text{الف) } \left(\frac{f+g}{f-g} \right)(1) = \frac{f(1)+g(1)}{f(1)-g(1)} = \frac{2+1}{2-1} = 3 \quad \left(\frac{f+g}{f-g} \right)(2) = \frac{f(2)+g(2)}{f(2)-g(2)} = \frac{3+3}{3-3} \quad \text{غير معرف}$$

$$\text{ج) } f(0)g(-1) = 0 \cdot 1 = 0$$

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

$$\text{الف) } g(x) = f(3x-1) \Rightarrow 3x-1=2 \Rightarrow x=1 \quad 3x-1=0 \Rightarrow x=\frac{1}{3} \quad 3x-1=-1 \Rightarrow x=0 \quad 3x-1=-2 \Rightarrow x=-\frac{1}{3} \quad 3x-1=3 \Rightarrow x=\frac{4}{3}$$

$$g(x) = \{(1, 1), (\frac{1}{3}, \infty), (-\frac{1}{3}, 2), (0, 4), (-\frac{1}{3}, -1)\}$$

$$\text{ب) } h(x) = f(1/x) \Rightarrow |x|=2 \Rightarrow x=\pm 2 \quad |x|=0 \Rightarrow x=0 \quad |x|=3 \Rightarrow x=\pm 3$$

$$|x|=-1 \quad \text{غير معرف} \quad |x|=-2 \quad \text{غير معرف}$$

$$h(x) = \{(1/2, 1), (-1/2, 4), (0, \infty), (1/3, -1), (-1/3, 2)\}$$