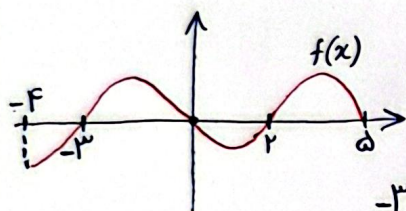


$$y = \sqrt{x f(x)} \rightarrow x f(x) \geq 0 \xrightarrow{\text{ریشه های } f} \begin{matrix} x = 2 \\ x = -5 \\ x = 5 \end{matrix}$$

← از ۵ تا ۰ حاصل ضرب + یا صفر است.

← از ۲ تا ۵ حاصل ضرب + یا صفر است.

$$\rightarrow D_f = [-5 \ 0] \cup [2 \ 5]$$



$$y = \sqrt{\frac{-x}{f(x)}} \rightarrow \frac{-x}{f(x)} \geq 0 \rightarrow f(x) \neq 0 \xrightarrow{\text{ریشه های } f} \begin{matrix} x = -3 \\ x = 0 \\ x = 2 \\ x = 5 \end{matrix}$$

$$\begin{matrix} -x > 0 \rightarrow x < 0 \\ -x < 0 \rightarrow x > 0 \end{matrix}$$

بازه	$-x$	$f(x)$	علامت کسر
$x < -3$	+	-	-
$-3 < x < 0$	+	+	+
$0 < x < 2$	-	-	+
$2 < x < 5$	-	+	-

x	-3	0	2	5
y	-	+	-	+

$$\rightarrow D_f = (-3 \ 0) \cup (0 \ 2) \xrightarrow{Z = -2, -1, 1} \text{اعداد صحیح}$$

$$f(x) - 2f(2) = x^2 - 3x + 4$$

$$\xrightarrow{x=2} f(2) - 2f(2) = 4 - 6 + 4 \rightarrow -f(2) = 2 \rightarrow f(2) = -2$$

$$\xrightarrow{x=-2} f(-2) - 2f(2) = 4 + 6 + 4 \rightarrow f(-2) + 4 = 14 \rightarrow f(-2) = 10$$

$$f(x) = \begin{cases} x - \sqrt{x} + 4 & x > 3 \\ 2x + 3 & x \leq 3 \end{cases}$$

$$\rightarrow f(f(5)) + f(f(1)) \xrightarrow{\text{نقطه ۲}} f(2) + f(5) \rightarrow 7 + 2 = 9$$

$$f(5) \xrightarrow{x \leq 3} 5 - \sqrt{5} + 4 = 5 - 2 = 3 \rightarrow f(2) \xrightarrow{x \leq 3} 2(2) + 3 = 7$$

$$f(1) \xrightarrow{x \leq 3} 2(1) + 3 = 5$$

$$f(x) = ax^2 - bx + 2$$

$$f(x-1) - f(x) = 9x + 2$$

$$(x = x-1)$$

$$f(x-1) = a(x-1)^2 - b(x-1) + 2 = ax^2 - 2ax + a - bx + b + 2$$

$$\rightarrow f(x-1) - f(x) = ax^2 - 2ax + a - bx + b + 2 - (ax^2 - bx + 2) = -2ax + a + b$$

$$\rightarrow \underline{-2ax + a + b = 9x + 2} \rightarrow \begin{cases} -2a = 9 \rightarrow a = -\frac{9}{2} \\ a + b = 2 \rightarrow b = \frac{13}{2} \end{cases} \rightarrow a - b = -\frac{9}{2} - \frac{13}{2} = -11$$

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

$$\rightarrow \frac{2f(2) + f(-1)}{f'(2)} \rightarrow \frac{2 + 0}{1} = \frac{2}{1} = \boxed{2}$$

$$\rightarrow 2f(2) = 2(4 - 6 + 1) = 2$$

$$\rightarrow f(-1) = 1 + 3 + 1 = 0 \quad \rightarrow f'(2) = (2 - 3 + 1)^2 = 1$$

$$f(x) \begin{cases} 3x + 1 & x \geq 2 \\ x^2 & x < 2 \end{cases} \quad \begin{cases} 3f(2) \xrightarrow{x \geq 2} 3(13) = 39 \\ 2f(-2) \xrightarrow{x < 2} 2(4) = 8 \\ f(2) \xrightarrow{x \geq 2} 7 \end{cases}$$

$$\frac{3f(2) - 2f(-2)}{f(2)} \rightarrow \frac{39 - 8}{7} = \boxed{\frac{31}{7}}$$

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

$$\rightarrow \frac{f(f(4)) - f(f(3))}{f(1) - 2} \rightarrow \frac{f(1) - f(2)}{6 - 2} \rightarrow \frac{6 - 2}{3} = \frac{4}{3} = \boxed{\frac{4}{3}}$$

$$f(x) = \frac{x^2 + 2x + 1}{x^2 + 2x + 0}$$

$$f(f(\sqrt{3} - 2)) \rightarrow \sqrt{3} - 2 = x \rightarrow \sqrt{3} = x + 2$$

$$\rightarrow f(\sqrt{3} - 2) = \frac{(\sqrt{3})^2 + 0}{(\sqrt{3})^2 + 1} = \frac{3 + 0}{3 + 1} = \frac{3}{4} = \frac{3}{4}$$

$$\rightarrow f(2) = \frac{4 + 4 + 1}{4 + 4 + 0} = \boxed{\frac{9}{8}}$$

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

$$\rightarrow f(\sqrt{x}) = (\sqrt{x})^2 + \frac{1}{(\sqrt{x})^2} = x + \frac{1}{x} \rightarrow (f(\sqrt{x}))^2 = \left(x + \frac{1}{x}\right)^2 = x^2 + \frac{1}{x^2} + 2$$

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

$$\rightarrow x^2 + \frac{1}{x^2} + 2 - \left(x^2 + \frac{1}{x^2}\right) \rightarrow \cancel{x^2} + \cancel{\frac{1}{x^2}} + 2 - \cancel{x^2} - \cancel{\frac{1}{x^2}} = \boxed{2}$$