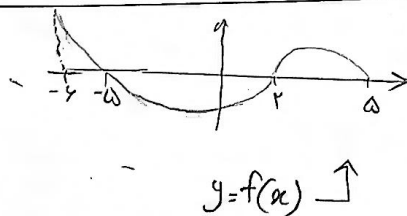


$$y = \sqrt{x f(x)} =$$

$$x f(x) \geq 0 \rightarrow \begin{cases} x \leq 0, f(x) \leq 0 & [-\infty, 0] \\ x \geq 0, f(x) \geq 0 & [2, \infty] \end{cases}$$

$$Df = [-\infty, 0] \cup [2, \infty]$$



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$$y = \sqrt{\frac{-x}{f(x)}} \rightarrow \begin{cases} x \leq 0, f(x) \geq 0 & \rightarrow (-2, 0) \\ x \geq 0, f(x) \leq 0 & \rightarrow (0, 2) \end{cases}$$

$$-1 \leq y \leq 1$$

$$x \leq 3$$



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

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

$$x=-2 \rightarrow f(-2) - (1 \cdot (-2) - 2) = (-2)^2 - 3 \cdot (-2) + 4 = 4 + 6 + 4 = 14 \Rightarrow f(-2) = 10$$

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$$f(f(5)) + f(f(1)) =$$

$$f(5\sqrt{5+4}) + f(2 \times 1 + 3) = f(2) + f(5) =$$

$$\rightarrow (2 \times 2 + 3) + 5 - \sqrt{5+4} = 7 + 2 = 9$$

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

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$$f(x-1) - f(x) = 4x + 2, \quad a-b = ?$$

$$x=1 \rightarrow f(0) - f(1) = 4 + 2 = 6$$

$$2 - f(1) = 6$$

$$f(1) = 2 - 6 = -4$$

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

$$\rightarrow x=0 \quad f(0) = 0 + 0 + 2 \Rightarrow f(0) = 2$$

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

$$-4 = a - b + 2 \rightarrow a - b = -6$$

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$$f(x) = \frac{x^2 + 4x + 5}{x^2 + 4x + 1}$$

$$f(\sqrt{3}-2) = ?$$

$$f(\sqrt{3}-2) = \frac{(\sqrt{3}-2)^2 + 4(\sqrt{3}-2) + 5}{(\sqrt{3}-2)^2 + 4(\sqrt{3}-2) + 1} = \frac{3+4-4\sqrt{3}+4\sqrt{3}-8+5}{3+4-4\sqrt{3}+4\sqrt{3}-8+1} = \frac{4}{4} = 1$$

$$f\left(x - \frac{1}{x}\right) = \frac{x^4 + 1}{x^2} \quad f(-3) = ?$$

$$x - \frac{1}{x} = -3 \rightarrow x^2 - 1 = -3x \rightarrow x^2 + 3x - 1 = 0 \quad \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \rightarrow \frac{-3 \pm \sqrt{9 - 4 \times 1 \times -1}}{2} = \frac{-3 \pm \sqrt{13}}{2}$$

$$\left(x - \frac{1}{x}\right)^2 = (-3)^2 = 9 \quad \frac{x^4 + 1}{x^2} = x^2 + \frac{1}{x^2} = \left(\frac{-3 \pm \sqrt{13}}{2}\right)^2 + \frac{1}{\left(\frac{-3 \pm \sqrt{13}}{2}\right)^2} = 11$$

$$x^2 + \frac{1}{x^2} = 9 \rightarrow x^2 + \frac{1}{x^2} = 11 \rightarrow f(-3) = 11$$

$$f(x) = \left\{ (2, 0), (1, -4), (0, 2), (5, 1) \right\}$$

$$g(x) = \sqrt{9 - x^2}$$

$$\begin{aligned} 9 - x^2 &\geq 0 \\ 9 &\geq x^2 \\ 3 &\geq x \\ x &\geq -3 \end{aligned}$$

$$\text{الف) } \frac{f}{g} = \left\{ \left(2, \frac{0}{\sqrt{9}}\right), \left(1, \frac{-4}{\sqrt{8}}\right), \left(0, \frac{2}{\sqrt{9}}\right) \right\}$$

$$\text{ب) } \frac{g}{f} = \left\{ \left(2, \frac{\sqrt{5}}{0}\right), \left(1, \frac{\sqrt{8}}{-4}\right), \left(0, \frac{2}{2}\right) \right\}$$

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$$f(x) = \left\{ (2, 1), (3, 4), (-5, 2), (1, -2) \right\}$$

$$\text{د) } f(2x) =$$

$$\text{الف) } 2f(x) = \left\{ (2, 2), (3, 8), (-5, 4), (1, -4) \right\}$$

$$\left\{ (1, 1), \left(\frac{3}{2}, 4\right), \left(\frac{-5}{2}, 2\right), \left(\frac{1}{2}, -2\right) \right\}$$

$$\text{ب) } f(x) + 1 = \left\{ (2, 2), (3, 5), (-5, 3), (1, -1) \right\}$$

$$\text{ج) } 3f^2(x) + 1 = \left\{ (2, 13), (3, 49), (-5, 13), (1, 13) \right\}$$

$$f(x) = \left\{ (2, 3), (5, 2), (1, 4), (3, 1), (5, 4) \right\}$$

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

$$\text{الف) } f \cdot g = \left\{ (2, 2), (1, 4), (3, 2) \right\}$$

$$\text{ب) } \frac{2f}{g} = \left\{ \left(2, \frac{4}{1}\right), \left(1, \frac{8}{0}\right), \left(3, \frac{2}{-1}\right) \right\} \rightarrow \left\{ (2, 4), (3, -2) \right\}$$

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