

۱) $f(m)$ از حدود $m=2$ تا $m=0$ منفی است و برای $m=\omega$ تا $m=2$ مثبت است.

$2f(m) \geq 0 \rightarrow D_f = [2, \omega] \cup \{0\}$

$0 \leq f(m) \leq 1$

نمودار: $\omega \quad 2 \quad 0 \quad -\Delta$
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$\frac{-m}{f(m)} \geq 0, f(m) \neq 0 \rightarrow m = 2, 0, -2 \Rightarrow$

$D_f = (-2, 0) \cup (0, 2)$

$\frac{m}{f(m)} \leq 0$

نمودار: $\omega \quad 2 \quad 0 \quad -2$
 $\text{---} | \text{---} | \text{---} | \text{---} | \text{---} |$
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$f(m) - 2f(2) = m^2 - 2m + K \xrightarrow{m=2} f(2) - 2f(2) = K - 4 + K$

$f(m) + K = m^2 - 2m + K$

$\rightarrow m = -2 \Rightarrow f(-2) + K = K + 4 + K$
 $f(-2) = 1.0$

$-f(2) = 2$
 $\Rightarrow f(2) = -2$

$f(m) = \begin{cases} m - \sqrt{m+K} & ; m > \omega \\ Km + \omega & ; m \leq \omega \end{cases}$

(I) $f(1) \rightarrow m=1 \Rightarrow \frac{1}{m} < \omega \rightarrow 1 \times 1 + \omega = \omega = f(1)$

$f(f(1)) = f(\omega)$

(II) $f(\omega) = 2 \rightarrow f(f(\omega)) = f(2)$

$\omega > \omega \rightarrow \omega - \sqrt{\omega+K} = 2 \Rightarrow f(f(1)) = 2$

$\Rightarrow f(2) = 2 \times 2 + \omega = \omega \Rightarrow f(f(\omega)) = \omega$

$\star f(f(1)) + f(f(\omega)) = 2 + \omega = 9$

$f(m-1) = a(m-1)^2 - b(m-1) + 2$

$f(m-1) = am^2 - 2am + a - b(m-1) + 2$

$f(m-1) = am^2 + m(-2a-b) + (a+b+2)$

$\Rightarrow f(m-1) - f(m) = am^2 - 2am + a - b(m-1) + 2 - am^2 + 2am - a - b(m-1) + 2 = -2am + a + b = 4m + 2$
 $\Rightarrow -2a = 4$

$a - b = -\omega - \omega = -1 \Rightarrow a + b = \omega$
 $b = \omega$

$a = -2$

$\frac{(\sqrt{\omega} - 2)^2 + K(\sqrt{\omega} - 2) + \omega}{(\sqrt{\omega} - 2)^2 + K(\sqrt{\omega} - 2) + \omega} = \frac{\omega + K - K\sqrt{\omega} + K\sqrt{\omega} - 1 + \omega}{\omega + K - K\sqrt{\omega} + K\sqrt{\omega} - 1 + \omega} = \frac{K}{4}$

$f(\sqrt{\omega} - 2) = \frac{2}{\omega}$

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

$$\downarrow$$

$$\text{if } \rightarrow x - \frac{1}{x} = -3 \Rightarrow \boxed{x^2 + \frac{1}{x^2} = 11}$$

$$\boxed{f(-3) = 11}$$

$$\text{الف) } \frac{f}{g} \xrightarrow{\text{لولا}} \left\{ \left(2, \frac{0}{\sqrt{10}}\right), \left(1, \frac{-4}{\sqrt{10}}\right), \left(0, \frac{2}{\sqrt{10}}\right) \right\}$$

$$\xrightarrow{\text{لولا}} D_f = \{0, 1, 2, 4\} \Rightarrow D_f \cap D_g = \{m | g(m) = 0\} \Rightarrow \{0, 1, 2\} - \{2\} =$$

$$D_g = [-3, 3]$$

$$\frac{g}{f} = \left\{ \left(1, -\frac{\sqrt{10}}{2}\right), \left(0, \frac{2}{\sqrt{10}}\right) \right\}$$

$$\text{ب) } \frac{g}{f} \rightarrow D_f \cap D_g = \{m | f(m) = 0\} \rightarrow \{0, 1, 2\} - \{2\} = \boxed{\{0, 1\}}$$

$$\text{الف) } \{(2, 2), (3, 8), (-5, 4), (1, -4)\}$$

$$\text{ب) } \{(2, 2), (3, 8), (-5, 3), (1, -1)\}$$

$$\text{ج) } \{(2, 4), (3, 49), (-5, 13), (1, 13)\}$$

$$\text{د) } \{(1, 1), \left(\frac{13}{2}, 4\right), \left(\frac{13}{2}, 2\right), \left(\frac{1}{2}, -2\right)\}$$

$$\text{الف) } f - g \Rightarrow \{(1, 4), (2, 2), (3, 2)\}$$

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