

Subject

کلاس اولی - هم (متر) - تالیف شماره ۱

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الف) $f(x) = \sqrt{x|x|}$, $g(x) = x$ (۵)

$x|x| \geq 0 \rightarrow x = [-\infty, +\infty) \hookrightarrow x = \mathbb{R}$ مساوی نیست

ب) $f(x) = \frac{(x^2+3)(x+1)+x+1}{x^2+5x+6}$, $g(x) = 1$

$x^2+5x+6 \rightarrow \Delta = b^2-4ac = 5^2-4 \times 1 \times 6 = 25-24 = 1 \rightarrow \Delta > 0$
 $\rightarrow D_f = \mathbb{R} \quad D_g = \mathbb{R} \rightarrow D_f = D_g$ مساوی است

ج) $f(x) = \frac{x \sin^2 x - x \sin x}{x \sin x - x^2}$, $g(x) = x \sin x$

$x \sin x - x^2 \neq 0 \rightarrow x \sin x \neq x^2 \rightarrow \sin x \neq \frac{x^2}{x} \rightarrow$ مساوی نیست

$D_f = \mathbb{R} \quad D_g = \mathbb{R}$ مساوی است

د) $f(x) = \frac{x}{|x|}$, $g(x) = \frac{|x|}{x}$

$|x| \neq 0 \rightarrow x \neq 0 \quad D_f = D_g = \mathbb{R} - \{0\}$ مساوی است

ه) $f(x) = \left[\frac{x^2}{x^2+1} \right]$, $g(x) = [x - [x]]$ (۵)

$f(x) = 0 \quad \hookrightarrow x - [x] = [0, 1) \rightarrow [x - [x]] = 0$ مساوی است

و) $f(x) = \frac{1}{[x]}$, $g(x) = \frac{1}{x[x]}$ مساوی نیست

$\mathbb{R} - [0, \frac{1}{x}) \hookrightarrow \mathbb{R} - [0, 1)$

ز) $f(x) = \frac{1}{\sqrt{x-|x|}}$, $g(x) = \frac{1}{\sqrt{|x|-x}}$

$x - |x| > 0 \rightarrow x > |x| \rightarrow D_f = \emptyset$ مساوی نیست

$|x| - x > 0 \rightarrow |x| > x \rightarrow D_g = (-\infty, 0)$

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$$2) f(x) = \begin{cases} \frac{x^r - x}{r} & ; x \neq 1 \\ 1 & ; x = 1 \end{cases}, g(x) = x^r + x$$

$$\frac{x^r - x}{r} = \frac{x(x^{r-1} - 1)}{r} = \frac{x(x+1)(x-1)}{r} = x(x+1) = x^r + x$$

→ 15, 16, 17

$$f(x) + g(x) = x^r + x + 1$$

$$f(x) - g(x) = x^r - x + 1$$

$$f'(x) - g'(x)$$

$$f(x) + g(x) = x^r + x + 1$$

$$+ f(x) - g(x) = x^r - x + 1$$

$$r f(x) = r x^r + r \rightarrow f(x) = x^r + 1 \rightarrow \boxed{f(x) = x^r + 1}$$

$$f(x) + g(x) = x^r + x + 1 \rightarrow x^r + 1 + g(x) = x^r + x + 1$$

$$\boxed{g(x) = x}$$

$$f'(x) - g'(x) = (x^r + 1)' - x' = x^{r-1} + 1 - 1 =$$

$$\boxed{f'(x) - g'(x) = x^{r-1} + 1}$$

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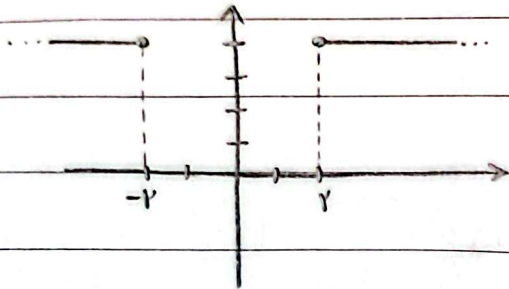
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$$f(x) = x - \sqrt{x^2 - r} \quad x^2 - \varepsilon \gg 0 \rightarrow x^2 \gg \varepsilon$$

$$g(x) = x + \sqrt{x^2 - r} \quad x \gg r, \quad x \leq -r$$

$$f \cdot g =$$

$$(x - \sqrt{x^2 - \varepsilon})(x + \sqrt{x^2 - \varepsilon}) = x^2 - (x^2 - \varepsilon) = x^2 - x^2 + \varepsilon = \varepsilon$$



$$f(x) = \frac{ax+r}{x^2 - mx + n}$$

$$g(x) = \frac{x-b}{rx^2 - px - \Delta}$$

$$am - bn = ?$$

$$rx^2 - px - \Delta = 0 \rightarrow \Delta = b^2 - 4ac = (-r)^2 - \varepsilon \times r(-\Delta) = 9 + \varepsilon \cdot 0 = \varepsilon 9$$

$$x = \frac{-b \pm \sqrt{\Delta}}{ra} = \frac{r \pm \sqrt{\varepsilon 9}}{r} \rightarrow x = -1, \quad x = r, \Delta$$

$$x^2 - mx + n = 0 \rightarrow \Delta = b^2 - 4ac = (-m)^2 - \varepsilon \times 1 \times n = m^2 - \varepsilon n$$

$$\frac{-b \pm \sqrt{\Delta}}{ra} = \frac{m \pm \sqrt{m^2 - \varepsilon n}}{r} = \frac{rm \pm r\sqrt{m^2 - \varepsilon n}}{\varepsilon} = \frac{r^2 \pm \sqrt{\varepsilon n}}{\varepsilon}$$

$$rm \pm r\sqrt{m^2 - \varepsilon n} = r^2 \pm \sqrt{\varepsilon n} \rightarrow rm = r^2 \rightarrow m = \frac{r^2}{r}$$

$$r\sqrt{m^2 - \varepsilon n} = \sqrt{\varepsilon n} \rightarrow \sqrt{m^2 - \varepsilon n} = r^2, \Delta \rightarrow m^2 - \varepsilon n = (r^2, \Delta)^2$$

$$\rightarrow m^2 - \varepsilon n = r^2, r^2 \Delta \rightarrow \frac{9}{\varepsilon} - \varepsilon n = r^2, r^2 \Delta \rightarrow r^2, r^2 \Delta - \varepsilon n = r^2, r^2 \Delta$$

$$-\varepsilon n = 1 \rightarrow n = \frac{1}{-\varepsilon} = -\frac{\Delta}{r} = r^2, \Delta \rightarrow n = -r^2, \Delta = -\frac{\Delta}{r}$$

$$\frac{ax+r}{x^2 - \frac{r^2}{r}x - \frac{\Delta}{r}} = \frac{x-b}{rx^2 - rx - \Delta} \rightarrow \frac{ax+r}{(x-\frac{\Delta}{r})(x+1)} = \frac{x-b}{r(x-\frac{\Delta}{r})(x+1)}$$

$$am - bn =$$

$$\frac{-r^2 \sqrt{\varepsilon n}}{r}$$

$$ax+r = \frac{x-b}{r} \rightarrow rax+r = x-b \rightarrow ra=1 \rightarrow a=\frac{1}{r}$$

$$\rightarrow +r = -b \rightarrow b = -\varepsilon$$

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$$am - bn = \frac{1}{r} \times \frac{r^2}{r} - (-\varepsilon) \times (-\frac{\Delta}{r}) = \frac{r^2}{r} - 1 =$$

$$\frac{r^2}{r} - \frac{\varepsilon}{r} = \frac{r^2 - \varepsilon}{r}$$

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$$f(x) = \frac{bx+r}{ax+b}$$

$$g(x) = c$$

(9)

$$Dg = IR - \{a\}$$

$$\frac{ab}{c} = \frac{-c \times ac}{c} = \frac{-ac^2}{c} = -ac$$

$$ax+b=0 \rightarrow ax=-b \rightarrow a = \frac{-b}{x} = -\frac{b}{x} = -\frac{ac}{x} = -c \rightarrow \boxed{a=-c}$$

$$f(1) = \frac{b+r}{a+b} = c \rightarrow b+r = ac+bc$$

$$f(r) = \frac{rb+r}{ra+b} = c \rightarrow \begin{aligned} rb+r &= rc+bc \\ -b-r &= -ac-bc \end{aligned}$$

$$\boxed{b=ac}$$

$$b+r = ac+bc \rightarrow ac+r = ac+ac^2 \rightarrow ac^2 = r \rightarrow c^2 = \frac{r}{a}$$

$$c^2 = \frac{r}{a} = \frac{1}{\varepsilon} \rightarrow c = \pm \frac{1}{\sqrt{\varepsilon}}$$

(2)

$$\frac{ab}{c} = -ac = -a\left(\pm \frac{1}{\sqrt{\varepsilon}}\right) = \boxed{\pm \varepsilon}$$

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$$f = \{(-1, 1), (1, 1), (1, -1), (0, 0)\}$$

(v)

$$g = \{(1, 1), (1, 1), (-1, -1), (0, 0)\}$$

$$fg = \{(1, 1), (1, 1), (-1, -1), (0, 0)\}$$

(v)

$$f = \{(-1, 1), (1, 1), (1, -1), (0, \frac{1}{p})\}$$

$$f+g = \{(1, 1), (1, 1), (-1, -1)\}$$

$$R = \{(1, 1), (1, 1), (-1, -1)\}$$

$$f = \{(1, a), (-1, a-1), (1, a), (1, a)\}$$

d+c

(v)

(v)

$$g = \{(1, -1), (-1, 1), (a-1, a)\}$$

$$a = d = -1$$

$$1a - 1b = 1 \rightarrow 1(-1) - 1b = 1 \rightarrow -1 - 1b = 1 \rightarrow -1 - 1 = 1b \rightarrow -2 = 1b \rightarrow b = -2$$

$$c = a - 1b = -1 - 1(-2) = -1 + 2 = +1 \rightarrow c = +1$$

$$d+c = -1+1 = 0 \rightarrow \boxed{d+c=0}$$

$$f(x) = \sqrt{-x^2 + x - m}$$

(v)

(v)

$$g(x) = \{a, b\}$$

$$-x^2 + x - m \geq 0 \rightarrow \Delta = b^2 - 4ac = 1^2 - 4(-1)(-m) = 1 - 4m = 0 \rightarrow 4m = 1 \rightarrow m = \frac{1}{4}$$

$$4m = 1 \rightarrow m = \frac{1}{4}$$

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

$$x = \frac{1}{2} \quad f(x) = \sqrt{-\frac{1}{4} + \frac{1}{2} - \frac{1}{4}} = \sqrt{0} = 0 \rightarrow g(m) = \{(\frac{1}{2}, 0)\}$$

$$a+b = \frac{1}{2} + 0 = \boxed{\frac{1}{2}}$$

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$$f(x) = \frac{rx + a}{x^r + 4x + b}$$

$$x - c \neq 0 \rightarrow x + c$$

①

$$x^r + 4x + b = (x - c)^r$$

$$g(x) = \frac{r}{x - c}$$

$$x^r + 4x + b = x^r - rx + c^r$$

$$4 = -rc \rightarrow c = -\frac{4}{r}$$

$$b = c^r \rightarrow b = \left(-\frac{4}{r}\right)^r = 9$$

$$b = 9 \quad c = -\frac{4}{r}$$

$$\frac{rx + a}{x^r + 4x + 9} = \frac{r}{x + \frac{4}{r}} \rightarrow \frac{rx + a}{(x + \frac{4}{r})^r} = \frac{r}{x + \frac{4}{r}} \xrightarrow{\times (x + \frac{4}{r})^r} rx + a = r(x + \frac{4}{r})$$

$$rx + a = rx + 4 \rightarrow a = 4$$

$$a + b + c = 4 + 9 - \frac{4}{r} = 1\frac{1}{r}$$

$$\boxed{a + b + c = 1\frac{1}{r}}$$