

دانش سرگرم کنکور اساتید تجربی ۹۹ - نظام جدید - سید محمد نورالدین - A

پایان خدا

$$\frac{2\sqrt{2}+2\sqrt{2}}{5-\sqrt{6}} - \frac{2}{\sqrt{3}-1} = \frac{2\sqrt{2}+2\sqrt{2}}{5-\sqrt{6}} \times \frac{5+\sqrt{6}}{5+\sqrt{6}} - \frac{2(\sqrt{3}+1)}{2}$$

$$= \frac{19(\sqrt{2}+\sqrt{2})}{19} - \sqrt{3}-1 = \sqrt{2}-1 \rightarrow \text{جواب}$$

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در صورتی: $a = 9^2 = 81$ $\rightarrow c = \frac{81+2a}{2} = 73 \rightarrow \text{جواب}$

$b = 81+1 = 82$

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* $P(x) = (x-1)(x+1)M(x) \rightarrow \begin{cases} P(1) = 0 \\ P(-1) = 0 \end{cases}$

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* $Q(1) = P(1) + P(-1) = 0 + 0 = 0 \rightarrow \text{جواب}$

* $\alpha + \beta = \frac{1}{\alpha\beta} \Rightarrow \frac{-(r-m-1)}{r} = \frac{r}{r-m} \Rightarrow (m-2)(r-m-1) - 9 = 0$

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$\rightarrow 2m^2 - 2m - 7 = 0$ $\xrightarrow{a+c=b} \begin{cases} m = -1 \rightarrow \Delta < 0 \rightarrow \text{عوض} \\ m = \frac{7}{2} \checkmark \rightarrow \text{جواب} \end{cases}$

* $1 < \frac{x+1}{x-1} < 2$ $\begin{cases} x-1 = x+1 \rightarrow x=2 \\ x+3 = x+1 \rightarrow x = \frac{2}{3} = 0.6 \end{cases} \Rightarrow x \in (0.6, 2) \rightarrow \text{جواب}$

مثلاً: $\frac{1+x}{1-x} = 2$ $\rightarrow -1 < \frac{x+1}{x-1} - 2 < 1 \rightarrow \left| \frac{-x+3}{x-1} \right| < 1 \rightarrow \dots$

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* $f(1) = 2 \rightarrow c = 2 \rightarrow f(x) = ax^2 + bx + 2$

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$\begin{cases} (2, 5) \\ (1, 2) \end{cases} \xrightarrow{\text{نقطه‌ها}} x_2 = \frac{-2+5}{2} = -1 = \frac{-b}{2a} \Rightarrow b = 2a \Rightarrow f(x) = ax^2 + 2ax + 2$

$(1, 1) \rightarrow 1 = 2a \rightarrow a = \frac{1}{2} \rightarrow f(x) = \frac{1}{2}x^2 + x + 2 \rightarrow f(-1) = 3 \rightarrow \text{جواب}$

$\sqrt{x} \xrightarrow{\text{مربع هر دو طرف}} \sqrt{x-12} \xrightarrow{\text{اضافه ۲ به هر دو طرف}} \sqrt{x-12} + 2 = g(x)$

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* $f(x) = g(x) \rightarrow \sqrt{x} = \sqrt{x-12} + 2 \Rightarrow \varepsilon \sqrt{x} \rightarrow x = 12 \text{ (جواب)} \Rightarrow A(12, 4)$

$\Rightarrow OA = \sqrt{12^2 + 4^2} = 4\sqrt{13} \rightarrow \text{جواب}$

$|2x^2 - 2| < 2x \rightarrow |x^2 - 1| < x \xrightarrow{\text{فاصله بین دو نقطه}} \text{جواب}$

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$\rightarrow -x < x^2 - 2 < x \rightarrow \begin{cases} x^2 + x - 2 > 0 \rightarrow (x+2)(x-1) > 0 \xrightarrow{x>0} x > 1 \text{ (۱)} \\ x^2 - x - 2 < 0 \rightarrow (x-2)(x+1) < 0 \xrightarrow{x>0} 0 < x < 2 \text{ (۲)} \end{cases}$

$\text{①} \cap \text{②} \rightarrow x \in (1, 2) \rightarrow \max(b-a) = 2-1 = 1 \rightarrow \text{جواب}$

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* $f(x) = 2x - [2x] \rightarrow D_f = D_g = \mathbb{R}, 0 \leq 2x - [2x] < 1 \rightarrow g \circ f = g(f(x))$

* $g(x) = -x^2 + \varepsilon x$

... , $g \circ f$ متناهی است

$\Rightarrow g(x) = -x^2 + \varepsilon x, 0 \leq x < 1 \rightarrow \text{در این بازه فاصله متناهی است}$
 $\Rightarrow \text{جواب} = [g(0), g(1)] = [0, \varepsilon] \rightarrow \text{جواب}$

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* $(4, a) \in f^{-1} \rightarrow (a, 4) \in f \rightarrow a + \sqrt{a} = 4 \rightarrow a = 4$

* $(12, b) \in f^{-1} \rightarrow (b, 12) \in f \rightarrow b + \sqrt{b} = 12 \rightarrow b = 9 \rightarrow a+b = 13 \rightarrow \text{جواب}$

پس: $f^{-1}(x) = \left(\sqrt{x + \frac{1}{4}} - \frac{1}{4}\right)^2 \rightarrow \dots$

$f(x) = x - \frac{x}{x^2}, x < 0 \rightarrow f'(x) = 1 + \frac{2}{x^3} > 0 \rightarrow \text{در این بازه فاصله متناهی است}$

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بنابراین به نقطه علامت کاهندگی می‌رسیم:

$f(x) = 0 \Rightarrow x - \frac{x}{x^2} = -x \Rightarrow x^2 = 1 \rightarrow x = \pm 1 \xrightarrow{x>0} x = 1 \rightarrow \text{جواب}$

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$$* \log_4 12 = \frac{\log_2 12}{\log_2 4} = \frac{1 + \log_2 6}{2} = \frac{1 + 1.2}{2} = \frac{2.2}{2} = 1.1 \rightarrow \text{جواب}$$

$$* \log_2 12 = 1.1 \rightarrow \log_2 6 = 1.2$$

$$+ f(1) = -2 \rightarrow -2 + 2^b = -2 \rightarrow b = 1$$

$$* f(-\frac{1}{2}) = 0 \rightarrow -2 + 2^{-\frac{a}{2} + 1} = 0 \rightarrow 2^{-\frac{a}{2} + 1} = 2 \rightarrow 1 - \frac{a}{2} = 2 \rightarrow a = -2$$

$$\rightarrow f(x) = -2 + 2^{-2x+1} \rightarrow f(-\frac{a}{2}) = -2 + 2^{2+1} = 6 \rightarrow \text{جواب}$$

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

$$\rightarrow (x^a)^2 - x(x^a) + 1 = 0 \xrightarrow{\Delta \rightarrow \dots} x^a = \frac{x \pm \sqrt{x^2 - 4}}{2} = x \pm \sqrt{x}$$

$$\log_2 \rightarrow a = \log_2 (x \pm \sqrt{x})$$

جواب: $a = \log_2 (x \pm \sqrt{x})$ $\leftarrow$ $a \in D_f$ $\leftarrow$ $a \in D_f$ $\leftarrow$ $a \in D_f$

$$\tan(40^\circ - 30^\circ) \cos(110^\circ + 30^\circ) + \tan(40^\circ - 30^\circ) \sin(140^\circ - 70^\circ)$$

$$= \tan(-10^\circ) (-\cos 80^\circ) + \tan(-10^\circ) \sin 70^\circ = \tan 10^\circ \cos 80^\circ - \tan 10^\circ \sin 70^\circ = 0$$

$$y = a + b \cos x \rightarrow y_{\max} = 3 \Rightarrow a - b = 3 \quad (1)$$

$$* y(\frac{\pi}{2}) = 0 \rightarrow a + b \cos(\frac{\pi}{2}) = 0 \rightarrow b = -2a \quad (2)$$

$$(1), (2) \rightarrow a = 1, b = -2 \rightarrow \text{جواب}$$

$$\text{دراصل } x = 0 \rightarrow ab < 0$$

$$* T = \frac{2\pi}{\omega} - (-\frac{2\pi}{\omega}) = 4\pi = \frac{2\pi}{|b|} \Rightarrow |b| = \frac{1}{2} \rightarrow \begin{cases} a = 2 \\ b = -\frac{1}{2} \end{cases} \text{ یا } \begin{cases} a = -2 \\ b = \frac{1}{2} \end{cases}$$

$$* |a| = \frac{1 - (-2)}{2} = \frac{3}{2} \rightarrow \frac{a}{b} = -2 \rightarrow \text{جواب}$$

$$\cos\left(x + \frac{\pi}{\varepsilon}\right) = \sin\left(x - \frac{\pi}{\varepsilon}\right) = \cos\left(x - \frac{\pi}{\varepsilon} - \frac{\pi}{\varepsilon}\right) = \cos\left(x - \frac{2\pi}{\varepsilon}\right) \quad - [143]$$

$$\Rightarrow x - \frac{2\pi}{\varepsilon} = 2k\pi \pm \left(x + \frac{\pi}{\varepsilon}\right) \rightarrow \begin{cases} x = 2k\pi + \pi (2\pi\varepsilon) \\ x = \frac{2k\pi}{\varepsilon} + \frac{\pi}{\varepsilon} \end{cases} \rightarrow \text{Yes}$$

$$\lim_{x \rightarrow (-r)^-} \frac{[x] + r}{x + r} = \frac{[(-r)^-] + r}{(-r)^- + r} = \frac{0}{0^-} = 0 \rightarrow \text{Yes}$$

$$\lim_{x \rightarrow \infty} \frac{a_n - \sqrt[n]{n^{r-1}}}{\varepsilon n^r - 12} = \frac{1}{r} \quad n=1 \rightarrow \frac{a}{\varepsilon} = \frac{1}{r} \rightarrow a = \frac{r}{\varepsilon} \quad - [145]$$

$$\lim_{x \rightarrow r} \frac{\frac{r}{r}x - \sqrt[n]{n^{r-1}}}{\varepsilon n - 12} = \frac{0}{0} \xrightarrow{\text{Hop}} \lim_{x \rightarrow r} \frac{\frac{r}{r} - \frac{r}{\sqrt[n]{n^{r-1}}}}{\varepsilon} = \frac{1}{r\varepsilon} \rightarrow \text{Yes}$$

$$\begin{aligned} \text{حساب} &= r = f(-r) \\ x = -r: \text{حساب} &= -r - rb + c \Rightarrow \boxed{c - rb = a} \quad (1) \quad - [146] \end{aligned}$$

$$\text{حساب} = \text{حساب} \Rightarrow f'_-(x) = \frac{-1}{r}, f'_+(-r) = +r + b \rightarrow b = -\frac{r}{r}$$

$$\rightarrow (1) \rightarrow c = \frac{1}{r} \rightarrow \text{Yes}$$

$$f(x) = \frac{x^2 + rx}{(x^2 - x)^r} \rightarrow f'(x) = \frac{(x^2 + r)(x^2 - x) - r(x^2 - 1)(x^2 + rx)}{(x^2 - x)^{\varepsilon}} \quad - [147]$$

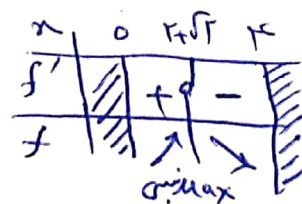
$$\rightarrow f'(r) = \frac{4(r) - r(r)(1)}{1 \times r} = -\frac{12}{\varepsilon} \rightarrow \text{Yes}$$

$$f(x) = x + \sqrt{\varepsilon x - x^2} \quad D_f = [0, \varepsilon] \rightarrow f'(x) = 1 + \frac{r-x}{\sqrt{\varepsilon x - x^2}} = 0 \quad - [148]$$

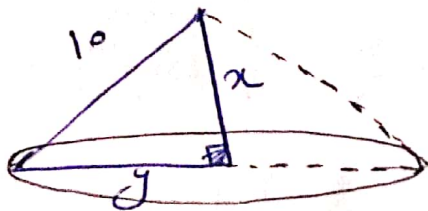
$$\rightarrow \sqrt{\varepsilon x - x^2} = x - r \quad f \geq x > r \rightarrow x = r \pm \sqrt{r} \rightarrow x = r + \sqrt{r}$$

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

$$\rightarrow A(r + \sqrt{r}, r + 2\sqrt{r}), x - y = 0 \rightarrow d = \frac{1 - \sqrt{r}}{\sqrt{r}} = 1 \rightarrow \text{Yes}$$



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$$V = \frac{1}{3} (\pi r^2) h, \quad r^2 + h^2 = 100$$

$$\Rightarrow V(r) = \frac{\pi r}{3} (100 - r^2) \rightarrow V'(r) = 0$$

$$\rightarrow r = \frac{100}{3} \rightarrow h^2 = 100 - \frac{10000}{9} = \frac{200}{3}$$

$$\rightarrow \frac{h^2}{r^2} = \frac{200}{100} \rightarrow \frac{h}{r} = \frac{\sqrt{2}}{1} \rightarrow \text{جواب}$$

روش اول: $\binom{9}{5} - \binom{2}{2} \times \binom{7}{3} = \frac{9 \times 8 \times 7 \times 6}{4 \times 3 \times 2 \times 1} - \frac{7 \times 6 \times 5}{3 \times 2 \times 1} = 7(11-5) = 42$

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روش دوم: $\binom{2}{1} \times \binom{7}{4} + \binom{7}{5} = 42$

مجموعه‌های ۲ نفر از آن‌ها را انتخاب می‌کنیم و در همان ۲ نفر شرکت می‌کنند

$(F_1, F_2, F_3, F_4, F_5) (E_1, E_2, E_3) \Rightarrow P = \frac{2! \times 4! \times 3!}{8!} = \frac{1}{28} \rightarrow \text{جواب}$

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$\bar{x} = 12, \quad \sigma^2 = \frac{\sum (x_i - \bar{x})^2}{12} = \frac{12(2) + 12(1)}{12} \Rightarrow \sigma = \frac{\sqrt{12}}{2}$

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$CV = \frac{\sigma}{\bar{x}} = \frac{\sqrt{12}}{24} \approx 0.12 \rightarrow \text{جواب}$

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$\Rightarrow S = \frac{1}{2} |(4+32-2) - (10+3-12)| = 20$

$S = \frac{AH \times BC}{2} \Rightarrow AH = \frac{2S}{BC} = \frac{20}{2\sqrt{2}} = 5\sqrt{2} \rightarrow \text{جواب}$

$* BC = \sqrt{2^2 + 2^2} = 2\sqrt{2}$

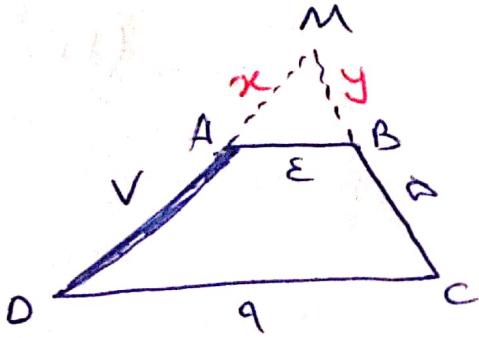
$m_{BC} = \frac{2+2}{2-2} = 1 \rightarrow \text{خط عمود بر BC}$

$AE: y+2 = x-2 \Rightarrow x-y-4=0$

فاصله A از این خط: $d = \frac{|1-2-4|}{\sqrt{1+1}} = 5\sqrt{2}$

A(1,2)

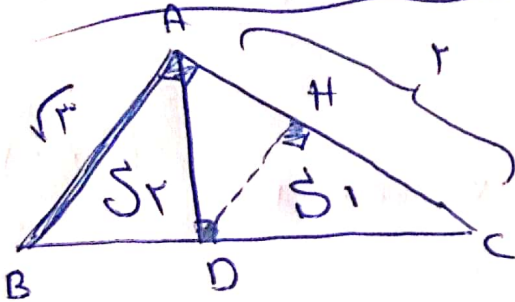
(نوال الدني)

122 - منظره ذریقه $\triangle ABC$: 122

$$\frac{x}{x+v} = \frac{\varepsilon}{a} \rightarrow \frac{x}{v} = \frac{\varepsilon}{a} \Rightarrow x = \frac{va}{a}$$

$$\frac{y}{a} = \frac{\varepsilon}{a} \rightarrow y = \varepsilon$$

$$MAB \text{ محیط } = x + y + \varepsilon = 1 + \frac{va}{a} = 1 + 0.12 = 1.12 \rightarrow \text{جواب}$$



$$BC = \sqrt{r + \varepsilon} = \sqrt{v}$$

$$AD \times BC = AB \times AC \rightarrow AD = \frac{r\sqrt{r}}{\sqrt{v}}$$

$$AD^2 = AH \times AC \Rightarrow \frac{\varepsilon \times r}{v} = AH \times r$$

$$\rightarrow AH = \frac{r}{v} \rightarrow HC = r - \frac{r}{v} = \frac{v-r}{v}$$

$$\text{از طرفی: } \triangle ABD \sim \triangle CDH \Rightarrow \frac{S_1}{S_r} = k^2 = \left(\frac{HC}{AD}\right)^2 = \frac{14}{21} \rightarrow \text{جواب}$$

سید محمد نورالدینی - ۹۹/۵/۳۱