

یوسف قاسمی

۱ - ۱۲۶

$$= \frac{\tan x}{\sqrt{\frac{1}{\cos^2 x}}} \left(\frac{1 - \sin^2 x}{\sin x} \right) = \frac{\tan x}{1} \times \frac{\cos^2 x}{\sin x}$$

با توجه به بازه $|\cos x| = -\cos x$

$$\frac{\sin x}{\cos x} \times -\cos x \times \frac{\cos^2 x}{\sin x} = -\cos^2 x$$

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$$\frac{1}{v+5} + \frac{1}{v-5} = \frac{9}{60} \rightarrow v = 15 \frac{\text{km}}{\text{h}}$$

$$\frac{1}{20} + \frac{1}{10} = \frac{1+2}{20} = \frac{3}{20} = \frac{9}{60} \text{ جاگذاری گزینه ها:}$$

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$$\frac{7x - 8 - x^2 - x}{(x-2)(x+1)} > 0 \rightarrow \frac{-x^2 + 6x - 8}{(x-2)(x+1)} < 0 \rightarrow \frac{-(x-2)(x-4)}{(x-2)(x+1)} < 0$$

$$\xrightarrow{x \neq 2} \frac{x-4}{x+1} < 0 \rightarrow -1 < x < 4 - \{2\}$$

روش دوم: جای گذاری گزینه ها

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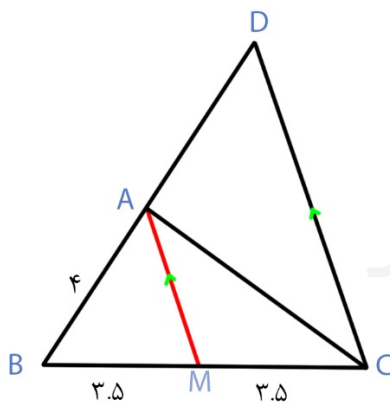
$$\binom{5}{3} \times \binom{4}{1} \times \binom{4}{1} \times \binom{4}{1} = \frac{5 \times 4}{2} \times 4 \times 4 \times 4 = 64.$$

۱-۱۳۰

$$\sqrt{3a+16} = 1-2a \rightarrow 3a+16 = 1-4a+4a^2 \rightarrow 4a^2-7a-15=0.$$

$$\Delta = 49+240 = 289 \rightarrow a = \frac{7 \pm 17}{8} = 3 \vee \frac{-5}{4} \rightarrow 4a+9 \xrightarrow{a=-\frac{5}{4}} -5+9=4$$

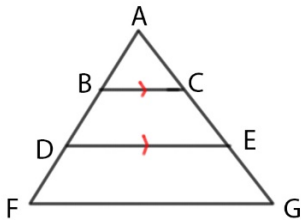
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قضیه ی تالس:

$$\frac{BM}{BC} = \frac{AB}{BD} \rightarrow \frac{1}{2} = \frac{4}{BD} \rightarrow BD = 8$$

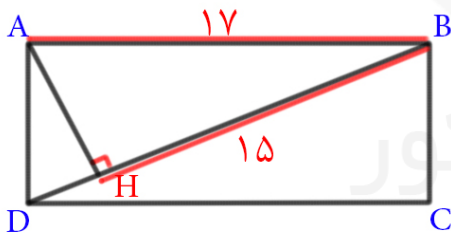
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ارتفاع های برابر

$$\left\{ \begin{array}{l} \frac{BC}{FG} = \frac{1}{3} \\ \frac{BC}{DE} = \frac{1}{2} \end{array} \right. \rightarrow \frac{S_{DEGF}}{S_{ABC}} = \frac{\frac{1}{2}h \times (2BC + 3BC)}{\frac{1}{2}h \times BC} = 5$$

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$$AB^2 = BH \times BD \rightarrow 289 = 15BD \rightarrow BD = \frac{289}{15} \rightarrow BD - 19 = \frac{4}{15}$$

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$$\sin\left(\frac{9\pi}{2} + \alpha\right) = \sin\left(\frac{8\pi + \pi}{2} + \alpha\right) = \sin\left(4\pi + \frac{\pi}{2} + \alpha\right) = \sin\left(\frac{\pi}{2} + \alpha\right) = \cos \alpha$$

$$\cos\left(\frac{7\pi}{2} - \alpha\right) = \cos\left(\frac{8\pi - \pi}{2} - \alpha\right) = \cos\left(4\pi - \frac{\pi}{2} - \alpha\right) = \cos\left(\frac{\pi}{2} + \alpha\right) = -\sin \alpha$$

$$\tan\left(\alpha - \frac{3\pi}{2}\right) = -\tan\left(\frac{3\pi}{2} - \alpha\right) = -\cot \alpha$$

$$\begin{aligned} \cos \alpha (-\sin \alpha) + \cot \alpha &= -\frac{1}{2} \sin 2\alpha + \frac{1}{\tan \alpha} = -\frac{1}{2} \times \frac{2 \tan \alpha}{1 + \tan^2 \alpha} + \frac{1}{\tan \alpha} \\ &= -\frac{1}{2} \times \frac{2 \times \frac{4}{3}}{1 + \frac{16}{9}} + \frac{3}{4} = \frac{27}{100} \end{aligned}$$

۳-۱۳۵

$$y = a + b \sin x \rightarrow \text{سینوس خوب} \rightarrow b > 0$$

$$\max(y) = 3 \xrightarrow{b > 0} a + b = 3$$

$$\left(-\frac{\Delta\pi}{6}, 0\right) \rightarrow a - b \sin \frac{\Delta\pi}{6} = 0 \rightarrow a = \frac{b}{2}$$

$$a + b = 3 \xrightarrow{b=2a} a = 1 \wedge b = 2$$

$$f\left(\frac{\pi}{6}\right) = 1 + 2 \sin \frac{\pi}{6} = 1 + 2 \times \frac{1}{2} = 2$$

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$$r^{x-r} = r^{rx} \rightarrow x^r - r = rx \rightarrow x^r - rx - r = 0 \rightarrow x = r \pm \sqrt{r}$$

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

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$$r \times \frac{1}{r} + a = 0 \rightarrow a = -1$$

$$(r, 0) \rightarrow 0 = -1 + \log_b^{(rx-r)} \rightarrow b = r$$

$$\begin{cases} y = -1 + \log_r^{(rx-r)} \\ y = 1 \end{cases} \rightarrow -1 + \log_r^{(rx-r)} = 1 \rightarrow x = 5$$

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$$f(r) = r$$

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

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

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$$\begin{cases} P(A) = x \\ P(B) = \frac{x}{2} \end{cases} \rightarrow P(A \cup B) = P(A) + P(B) - P(A) \times P(B)$$

$$\rightarrow \frac{7}{9} = \frac{3}{2}x - \frac{1}{2}x^2 \rightarrow \frac{1}{2}x^2 - \frac{3}{2}x + \frac{7}{9} = 0 \rightarrow \Delta = \frac{9}{4} - \frac{14}{9} = \frac{25}{36}$$

$$x = \frac{\frac{3}{2} \pm \frac{5}{6}}{1} \rightarrow x = \frac{7}{3} \sqrt{\boxed{x = \frac{2}{3}}}$$

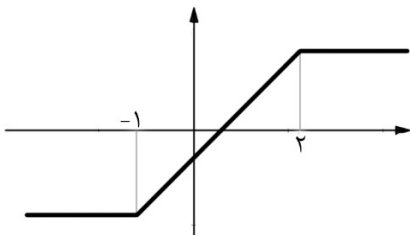
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$$\bar{x}_A = 14 \quad \sigma_A^2 = \frac{4+1+0+1+4}{5} = 2 \rightarrow CV_A = \frac{\sqrt{2}}{14} \approx 0.11$$

$$\bar{x}_B = 14/5 \quad \sigma_B^2 = \frac{9+2/25+1+2/25+4}{5} = 3/7 \rightarrow CV_B = \frac{\sqrt{3/7}}{14/5} \approx 0.13$$

$$CV_A < CV_B \rightarrow A$$

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$$\cos 3x = -\cos x \rightarrow \cos 3x = \cos(\pi - x)$$

$$\begin{cases} 3x = 2k\pi + \pi - x & x = \frac{k\pi}{2} + \frac{\pi}{4} \\ 3x = 2k\pi - \pi + x & x = k\pi - \frac{\pi}{2} \end{cases} \rightarrow$$

$$\cos x \neq 0 \rightarrow x = \frac{k\pi}{2} + \frac{\pi}{4} \text{ جواب}$$

۴-۱۴۳

$$\frac{0}{0} \text{ HOP} \rightarrow \lim_{x \rightarrow 2} \frac{\frac{3}{\sqrt[3]{(3x+2)^2}}}{1 \cdot x - 18} = -\frac{1}{8}$$

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$$\lim_{x \rightarrow \frac{2\pi}{3}^+} f(x) = \lim_{x \rightarrow \frac{2\pi}{3}^+} \frac{\sin x}{1 + 2\cos x} = \frac{\frac{\sqrt{3}}{2}}{1 + 2 \times \frac{-1}{2}} = \frac{\frac{\sqrt{3}}{2}}{0^-} = -\infty$$

$$x > \frac{2\pi}{3} \xrightarrow{\cos x \searrow} \cos x < \cos \frac{2\pi}{3} \rightarrow \cos x < -\frac{1}{2} \rightarrow 1 + 2\cos x < 0$$

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$$\lim_{x \rightarrow -\infty} \frac{x - \sqrt{4x^2 + x}}{x} = \lim_{x \rightarrow -\infty} \frac{x - 2 \sqrt{x + \frac{1}{4}}}{x} = \lim_{x \rightarrow -\infty} \frac{x + 2x + \frac{1}{4}}{x} = 3$$

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$$f'(x) = \frac{-1 \times \sqrt{x} - \frac{1}{2\sqrt{x}} \times (-x-1)}{(\sqrt{x})^2} \Bigg|_{x=\frac{1}{4}} = 3$$

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$$\begin{cases} \frac{\lambda}{2a+b} = -\lambda - 12 \\ \frac{-a}{(ax+b)^2} = -3x^2 + 6 \end{cases} \Bigg|_{x=2} \rightarrow \frac{-a}{(2a+b)^2} = -6 \rightarrow a=3$$

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$$f'(x) = \sqrt{\frac{3x+1}{x+2}} + \frac{\frac{5}{(x+2)^2}}{\sqrt[3]{\left(\frac{3x+1}{x+2}\right)^2}} \Bigg|_{x=-2} = \frac{3}{4}$$

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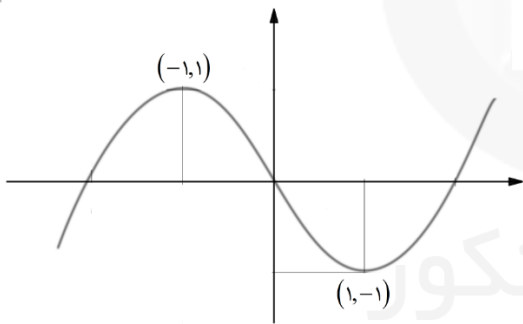
$$m = \frac{f(\lambda) - f(0)}{\lambda - 0} = \frac{3 - (-5)}{\lambda} = 1$$

$$f'(x) = \frac{9}{(x+1)^2} = 1 \rightarrow |x+1| = 3 \rightarrow x = -4 \vee \boxed{x = 2}$$

$$\begin{cases} (2, 1) \\ m = 1 \end{cases} \rightarrow y - x = -1 \rightarrow y = x - 1 \xrightarrow{x=0} y = -1$$

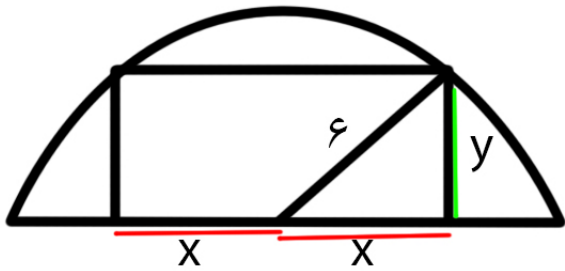
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$$f(x) = x|x| - 2x = \begin{cases} x^2 - 2x & x \geq 0 \\ -x^2 - 2x & x < 0 \end{cases}$$



$$A(-1, 1) \quad B(1, -1) \rightarrow AB = 2\sqrt{2}$$

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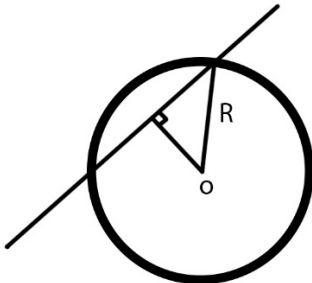


$$x^2 + y^2 = 36 \rightarrow y = \sqrt{36 - x^2}$$

$$s = 2xy = 2x\sqrt{36 - x^2} \rightarrow s' = 2\sqrt{36 - x^2} - \frac{1}{\sqrt{36 - x^2}} \times (2x) = 0$$

$$x^2 = 18 \rightarrow x = 3\sqrt{2} \rightarrow \text{Max}(s) = 2 \times 3\sqrt{2} \times \sqrt{18} = 36$$

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$$2x - 3y + 1 = 0 \rightarrow d = \frac{|-2 - 12 + 1|}{\sqrt{4 + 9}} = \sqrt{13}$$

$$R^2 = (\sqrt{7})^2 + (\sqrt{13})^2 = 20$$

$$(x+1)^2 + (y-4)^2 = 20 \xrightarrow{y=2} (x+1)^2 = 16 \rightarrow |x+1| = 4 \rightarrow x = 3 \vee -5$$

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$$1+(2 \times 2) , 2+(2 \times 3) , 3+(2 \times 4) , \dots , a_n = n+2(n+1)$$

$$a_{12} = 12+2 \times 13 = 38$$

۴-۱۵۴

$$(g^{-1} \circ f^{-1})(\lambda) = (f \circ g)^{-1}(\lambda) = a \rightarrow f \circ g(a) = \lambda$$

$$f(g(a)) = \lambda \rightarrow \frac{2}{5}g(a) - 4 = \lambda \rightarrow g(a) = 30$$

$$a^2 + a = 30 \rightarrow a = 3$$

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$$\frac{5}{18} \times \frac{7}{10} + \frac{7}{18} \times \frac{8}{10} + \frac{6}{18} \times \frac{9}{10} = \frac{29}{36}$$

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