

Открытая региональная межвузовская олимпиада вузов Томской области (ОРМО)

Общий балл	Дата	Ф.И.О. членов жюри	Подписи членов жюри
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№2

$$\begin{array}{cccc}
 \Pi & \theta & \mu & t \\
 \frac{2}{x} & \frac{3}{y} & \frac{2\theta}{z} & \frac{1}{10} \\
 \frac{5}{x} & \frac{6}{y} & \frac{3\theta}{z} & 2\frac{2}{5} \\
 \frac{4}{x} & \frac{5}{y} & \frac{6\theta}{z} & t
 \end{array}$$

$$\begin{cases}
 k \cdot \left(\frac{2}{x} + \frac{3}{y} + \frac{2\theta}{z} \right) = \frac{1}{10} \\
 l \cdot \left(\frac{5}{x} + \frac{6}{y} + \frac{3\theta}{z} \right) = 2\frac{2}{5} \\
 p \cdot \left(\frac{4}{x} + \frac{5}{y} + \frac{6\theta}{z} \right) = t
 \end{cases}$$

$$\begin{cases}
 2k + 5l = 4p \\
 3k + 8l = 5p \\
 2\theta k + 3\theta l = 6\theta p
 \end{cases}$$

7

$$\begin{cases}
 \left(\frac{2}{x} \right) \cdot k + \left(\frac{5}{x} \right) \cdot l = \left(\frac{4}{x} \right) p \\
 \left(\frac{3}{y} \right) k + \left(\frac{6}{y} \right) l = \left(\frac{5}{y} \right) p \\
 \left(\frac{2\theta}{z} \right) k + \left(\frac{3\theta}{z} \right) l = \left(\frac{6\theta}{z} \right) p
 \end{cases}$$

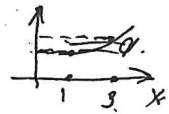
$$\begin{cases}
 2k - 16p = 4p \\
 3k - 16p = 5p \\
 2k - 5p = 8p
 \end{cases}
 \quad \begin{cases}
 k = 7p \\
 k = 7p \\
 k = 7p
 \end{cases}$$

$$\begin{aligned}
 2k - 2k + 2l &= -4p \\
 l &= -2p
 \end{aligned}
 \quad \begin{aligned}
 \text{пусть } p &= 1; \quad l = -2 \\
 k &= 7.
 \end{aligned}$$

$$t = 7 \cdot \frac{1}{10} + (-2 \cdot 2 \cdot \frac{2}{5}) = \frac{77}{10} - \frac{48}{10} = \frac{77-48}{10} = \frac{29}{10} = 2,9 = 2 \text{ ч } 54 \text{ мин.}$$

$$2019 \cdot \sqrt[3]{3,5x - 2,5} + 2018 \cdot \log_2(3x - 1) + m = 2020 - m$$

$$a = 2019 \cdot \sqrt[3]{\frac{7}{2}x - \frac{5}{2}} + 2018 \log_2(3x - 1)$$



$x \in [1; 3]$
 $3x - 1 > 0$
 $3,5x - 2,5 > 0$

доказать монотонность для того чтобы.

$$f'(x) = 2019 \cdot \frac{1}{3} \left(\frac{7x}{2} - \frac{5}{2} \right)^{-\frac{2}{3}} \cdot \frac{7}{2} + 2018 \cdot \frac{3}{\ln 2} \cdot \frac{1}{3x-1} > 0$$

$$f(1) = 2019 + 2018 = 4037$$

$$f(3) = 2019 \cdot 2 + 2018 \cdot 3 = 10092$$

$$4037 \leq a \leq 10092$$

$$8072 \leq m \leq 2017$$

$$4037 \leq 2020 - m \leq 10092$$

$$\begin{cases}
 2020 - m \geq 4037 \\
 2020 - m \leq 10092
 \end{cases}
 \quad \begin{cases}
 m \leq 2017 \\
 m \geq 8072
 \end{cases}$$

$$\left. \begin{array}{l} a < 1 \\ b < 1 \\ c < 1 \\ a+b+c \geq \frac{1}{2} \end{array} \right\}$$

$$(1-a)(1-b)(1-c) \leq \frac{125}{216} = \left(\frac{5}{6}\right)^3$$

$$\leq |a+b+c| \geq \frac{1}{2}$$

$$\begin{cases} 1-a \leq \frac{5}{6} \\ 1-b \leq \frac{5}{6} \\ 1-c \leq \frac{5}{6} \end{cases} \Rightarrow \begin{cases} a \geq \frac{1}{6} \\ b \geq \frac{1}{6} \\ c \geq \frac{1}{6} \end{cases}$$

н1

$$\begin{cases} x-y = \sqrt{\frac{1}{2}} \\ y - 2\sqrt{x} + 2 = 0 \end{cases} \Rightarrow \begin{cases} y = x - \sqrt{\frac{1}{2}} \\ (x - \sqrt{\frac{1}{2}})^2 - 4x + 4 = 0 \end{cases}$$

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

$$\sqrt{\frac{1}{2}} \cdot \frac{1}{2} x^3 + \frac{1}{9} - 16x^3 + 16 = 0 \quad x^2 = t$$

$$y_1 = \sqrt{\frac{18 + \sqrt{255}}{2}} - \sqrt{\frac{1}{2}}$$

$$\sqrt{x_1} + \sqrt{x_2} = 2 \quad x_1 = 1 \quad y = \frac{1}{2}$$

$$y_2 = \frac{18 + \sqrt{255}}{2} - \frac{36 + 2\sqrt{255}}{2} + \frac{1}{2} = \sqrt{255.5}$$

$$x - 2\sqrt{x} + 2 = 0 \quad \text{или} \quad x - 2\sqrt{x} + 3 = 0$$

$$t^2 - 18t + 16 = 0 \quad D = 259$$

$$t_{1,2} = \frac{18 \pm \sqrt{259}}{2}$$

$$y_{1,2} = \sqrt{\frac{18 \pm \sqrt{259}}{2}}$$

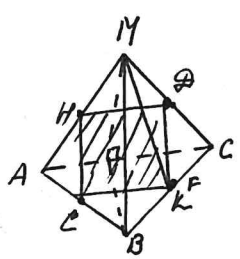
$$y = x - \frac{1}{2}$$

$$x - \frac{1}{2} - 2\sqrt{x} + 2 = \frac{1}{2}$$

Решет $x=1; y=\frac{1}{2}$

$\triangle ABC$ - правильный. $AB \perp BC = AC = a$
 $HN \perp EK$ - нв. т.к. $EK \parallel AC \parallel MN$.
 $HE \parallel MB \parallel DK$.

$\angle BAC = 90^\circ$ (по 2 о. 3х1).
 $MM' \perp BN' \Rightarrow MN \perp AC$.

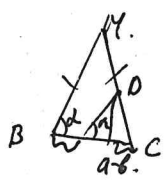


$$MN = NK = KE = EN = a$$

$$V = \frac{1}{3} S_{\text{осн}} \cdot H$$

$$\cos \alpha = \frac{a-b}{2b} < 1 \quad b > \frac{1}{3}a \Rightarrow \frac{1}{3}a < b < a$$

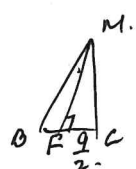
$$a-b < 2b \Rightarrow b > \frac{1}{3}a$$



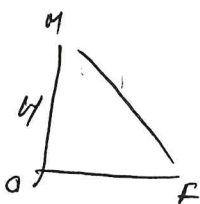
$$MF = \frac{a}{2} \cdot \tan \alpha$$

$$\tan^2 \alpha = \frac{4b^2}{(a-b)^2} - 1$$

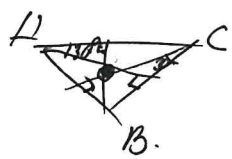
$$\tan^2 \alpha + 1 = \frac{1}{\cos^2 \alpha}$$



$$AF = \frac{\sqrt{3}}{2} a = a \cdot \cos 30^\circ$$



$$OF = \frac{1}{2} MF = \frac{a}{2\sqrt{3}}$$



$$H^2 = MF^2 - OF^2 = \frac{a^2}{4} \cdot \tan^2 \alpha - \frac{a^2}{4 \cdot 3}$$

$$H = \frac{a}{2} \sqrt{\frac{3 \tan^2 \alpha - 1}{3}}$$

$$V = \frac{1}{3} \cdot \frac{1}{2} a^2 \cdot \frac{\sqrt{3}}{2} \cdot \frac{a}{2} \sqrt{\frac{3 \tan^2 \alpha - 1}{3}}$$