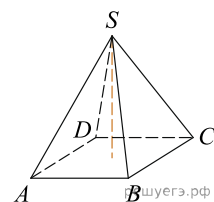


$$\vec{a}(3; -2) \quad \vec{b}(0; 1).$$

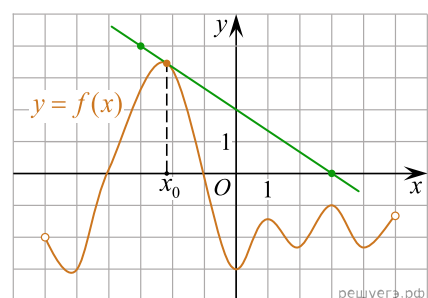
$$\vec{a} \cdot \vec{b}.$$



$$2^{4-2x} = 64.$$

$$\frac{\sqrt[3]{7} \cdot \sqrt[8]{7}}{\sqrt[5]{7}}.$$

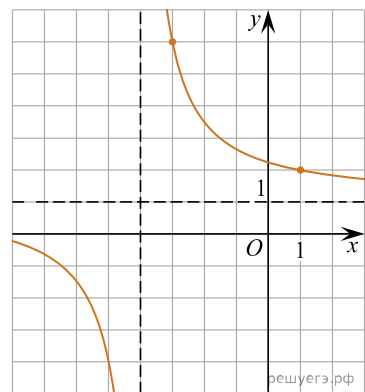
$$y = f(x)$$



$$u=\frac{m}{m+M}v\cos\alpha\qquad m=80\qquad v=3\qquad\alpha\qquad M=400$$

$$f(x)=\frac{kx+a}{x+b}.$$

$$y=7+6x-2x^{\frac{3}{2}}.$$



$$\cos 3x-\sin\left(7x-\frac{\pi}{2}\right)=\cos 5x.$$

$$\left(-\pi;\frac{\pi}{2}\right).$$

$$2\sqrt{3},\; SA=SC=\sqrt{33},\; SB=7.$$

$$4\cdot 2^{\log_3(5-x)}+2^{\log_3x+1}-2^{\log_3(5x-x^2)}\leqslant 8.$$

---

$$CM : MA = 2 : 25 \quad CN : NB = 2 : 1.$$

---

$$|x - a^2 + a + 2| + |x - a^2 + 3a - 1| = 2a - 3$$

---

---

|  |       |  |
|--|-------|--|
|  |       |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |
|  | <hr/> |  |

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

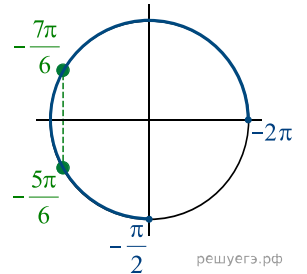
$$2\cos^3 x + \sqrt{3}\cos^2 x + 2\cos x + \sqrt{3} = 0 \Leftrightarrow 2\cos x(\cos^2 x + 1) + \sqrt{3}(\cos^2 x + 1) = 0 \Leftrightarrow 2\cos^3 x + \sqrt{3}\cos^2 x + 2\cos x + \sqrt{3} = 0 \Leftrightarrow \\ \Leftrightarrow 2\cos x(\cos^2 x + 1) + \sqrt{3}(\cos^2 x + 1) = 0 \Leftrightarrow$$

$$\Leftrightarrow (\cos^2 x + 1)(2\cos x + \sqrt{3}) = 0 \Leftrightarrow 2\cos x + \sqrt{3} = 0 \Leftrightarrow \cos x = -\frac{\sqrt{3}}{2} \Leftrightarrow x = \pm \frac{5\pi}{6} + 2\pi k, k \in \mathbb{Z}. \Leftrightarrow (\cos^2 x + 1)(2\cos x + \sqrt{3}) = 0 \Leftrightarrow 2\cos x + \sqrt{3} = 0 \Leftrightarrow \\ \Leftrightarrow \cos x = -\frac{\sqrt{3}}{2} \Leftrightarrow x = \pm \frac{5\pi}{6} + 2\pi k, k \in \mathbb{Z}. \Leftrightarrow (\cos^2 x + 1)(2\cos x + \sqrt{3}) = 0 \Leftrightarrow \\ \Leftrightarrow 2\cos x + \sqrt{3} = 0 \Leftrightarrow \cos x = -\frac{\sqrt{3}}{2} \Leftrightarrow \\ \Leftrightarrow x = \pm \frac{5\pi}{6} + 2\pi k, k \in \mathbb{Z}.$$

$$-\frac{7\pi}{6}, -\frac{5\pi}{6}.$$

$$\pm \frac{5\pi}{6} + 2\pi k, k \in \mathbb{Z}; \quad -\frac{7\pi}{6}, -\frac{5\pi}{6}.$$

$$\left[-2\pi; -\frac{\pi}{2}\right].$$



|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

$$AO = \sqrt{33 - x^2}, \quad BO = \sqrt{49 - x^2}. \\ BM = \frac{\sqrt{3}}{2} \cdot 2\sqrt{3} = 3,$$

$$x^2 \leq 33 \quad BO \geq \sqrt{49 - 33} = 4.$$

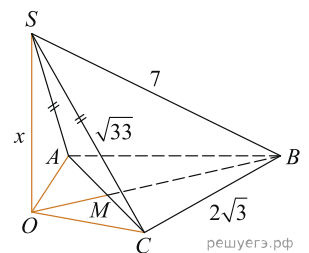
$$MO = \sqrt{SM^2 - SO^2} = \sqrt{30 - x^2}.$$

$$SM = \sqrt{SA^2 - AM^2} = \sqrt{30}.$$

$$\left(3 + \sqrt{30 - x^2}\right)^2 + x^2 = 49 \Leftrightarrow 6\sqrt{30 - x^2} = 10 \Leftrightarrow$$

$$\Leftrightarrow 30 - x^2 = \left(\frac{5}{3}\right)^2 \Leftrightarrow x^2 = \frac{245}{9} \Leftrightarrow x = \frac{7}{3}\sqrt{5}.$$

$$MO = \frac{5}{3}, \quad BO = \frac{14}{3}$$



$$V_{ABCOS} = \frac{1}{3} \cdot SO \cdot S_{ABCO} = \frac{7}{9} \sqrt{5} \cdot AC \cdot BO \cdot \frac{1}{2} = \frac{7}{18} \sqrt{5} \cdot 2\sqrt{3} \cdot \frac{14}{3} = \frac{98\sqrt{15}}{27}. V_{ABCOS} = \frac{1}{3} \cdot SO \cdot S_{ABCO} = \frac{7}{9} \sqrt{5} \cdot AC \cdot BO \cdot \frac{1}{2} = \frac{7}{18} \sqrt{5} \cdot 2\sqrt{3} \cdot \frac{14}{3} = \frac{98\sqrt{15}}{27}.$$

$$BM = 3.$$

$$SM^2 = SC^2 - MC^2 = 30.$$

$$\begin{aligned} SB^2 &= BM^2 + SM^2 - 2 \cdot BM \cdot SM \cdot \cos \angle BMS \Leftrightarrow \\ \Leftrightarrow 49 &= 9 + 30 - 2 \cdot 3 \cdot \sqrt{30} \cos \angle BMS \Leftrightarrow \cos \angle BMS = -\frac{\sqrt{30}}{18} < 0. \quad SB^2 = BM^2 + SM^2 - 2 \cdot BM \cdot SM \cdot \cos \angle BMS \Leftrightarrow \\ &\Leftrightarrow 49 = 9 + 30 - 2 \cdot 3 \cdot \sqrt{30} \cos \angle BMS \Leftrightarrow \\ &\Leftrightarrow \cos \angle BMS = -\frac{\sqrt{30}}{18} < 0. \end{aligned}$$

$$\angle BMS$$

$$\frac{98\sqrt{15}}{27}.$$

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

$$\begin{aligned} 2^{\log_3 x + 1} - 8 &= 2 \cdot 2^{\log_3 x} - 8 = 2 \cdot (2^{\log_3 x} - 4), \\ 4 \cdot 2^{\log_3(5-x)} - 2^{\log_3(5x-x^2)} &= 4 \cdot 2^{\log_3(5-x)} - 2^{\log_3(5-x) + \log_3 x} = \\ = 4 \cdot 2^{\log_3(5-x)} - 2^{\log_3(5-x)} \cdot 2^{\log_3 x} &= 2^{\log_3(5-x)} \cdot (4 - 2^{\log_3 x}) \cdot 4 \cdot 2^{\log_3(5-x)} - 2^{\log_3(5x-x^2)} = \\ &= 4 \cdot 2^{\log_3(5-x)} - 2^{\log_3(5-x) + \log_3 x} = \\ &= 4 \cdot 2^{\log_3(5-x)} - 2^{\log_3(5-x)} \cdot 2^{\log_3 x} = \\ &= 2^{\log_3(5-x)} \cdot (4 - 2^{\log_3 x}). \end{aligned}$$

$$\begin{aligned} 2^{\log_3(5-x)} \cdot (4 - 2^{\log_3 x}) + 2 \cdot (2^{\log_3 x} - 4) &\leq 0 \Leftrightarrow (4 - 2^{\log_3 x}) (2^{\log_3(5-x)} - 2) \leq 0. \quad 2^{\log_3(5-x)} \cdot (4 - 2^{\log_3 x}) + 2 \cdot (2^{\log_3 x} - 4) \leq 0 \Leftrightarrow \\ &\Leftrightarrow (4 - 2^{\log_3 x}) (2^{\log_3(5-x)} - 2) \leq 0. \end{aligned}$$

$$\begin{aligned} (2^2 - 2^{\log_3 x}) (2^{\log_3(5-x)} - 2) &\leq 0 \Leftrightarrow (2 - \log_3 x)(\log_3(5-x) - 1) \leq 0 \Leftrightarrow \\ \Leftrightarrow (\log_3 9 - \log_3 x)(\log_3(5-x) - \log_3 3) &\leq 0 \Leftrightarrow \begin{cases} (9-x)(5-x-3) \leq 0, \\ x > 0, \\ 5-x > 0 \end{cases} \Leftrightarrow \\ \Leftrightarrow \begin{cases} (9-x)(2-x) \leq 0, \\ 0 < x < 5 \end{cases} \Leftrightarrow \begin{cases} 2 \leq x \leq 9, \\ 0 < x < 5 \end{cases} \Leftrightarrow 2 \leq x < 5. \quad (2^2 - 2^{\log_3 x}) (2^{\log_3(5-x)} - 2) &\leq 0 \Leftrightarrow (2 - \log_3 x)(\log_3(5-x) - 1) \leq 0 \Leftrightarrow \\ \Leftrightarrow (\log_3 9 - \log_3 x)(\log_3(5-x) - \log_3 3) &\leq 0 \Leftrightarrow \\ \Leftrightarrow \begin{cases} (9-x)(5-x-3) \leq 0, \\ x > 0, \\ 5-x > 0 \end{cases} \Leftrightarrow \\ \Leftrightarrow \begin{cases} (9-x)(2-x) \leq 0, \\ 0 < x < 5 \end{cases} \Leftrightarrow \begin{cases} 2 \leq x \leq 9, \\ 0 < x < 5 \end{cases} \Leftrightarrow 2 \leq x < 5. \quad (2^2 - 2^{\log_3 x}) (2^{\log_3(5-x)} - 2) &\leq 0 \Leftrightarrow \end{aligned}$$

$$\begin{aligned}
&\Leftrightarrow (2 - \log_3 x)(\log_3(5 - x) - 1) \leq 0 \Leftrightarrow \\
&\Leftrightarrow (\log_3 9 - \log_3 x)(\log_3(5 - x) - \log_3 3) \leq 0 \Leftrightarrow \\
&\Leftrightarrow \begin{cases} (9 - x)(5 - x - 3) \leq 0, \\ x > 0, \\ 5 - x > 0 \end{cases} \Leftrightarrow \begin{cases} (9 - x)(2 - x) \leq 0, \\ 0 < x < 5 \end{cases} \Leftrightarrow \\
&\Leftrightarrow \begin{cases} 2 \leq x \leq 9, \\ 0 < x < 5 \end{cases} \Leftrightarrow 2 \leq x < 5. \quad (2^2 - 2^{\log_3 x})(2^{\log_3(5 - x)} - 2) \leq 0 \Leftrightarrow \\
&\Leftrightarrow (2 - \log_3 x)(\log_3(5 - x) - 1) \leq 0 \Leftrightarrow \\
&\Leftrightarrow (\log_3 9 - \log_3 x)(\log_3(5 - x) - \log_3 3) \leq 0 \Leftrightarrow \\
&\Leftrightarrow \begin{cases} (9 - x)(5 - x - 3) \leq 0, \\ x > 0, \\ 5 - x > 0 \end{cases} \Leftrightarrow \\
&\Leftrightarrow \begin{cases} (9 - x)(2 - x) \leq 0, \\ 0 < x < 5 \end{cases} \Leftrightarrow \\
&\Leftrightarrow \begin{cases} 2 \leq x \leq 9, \\ 0 < x < 5 \end{cases} \Leftrightarrow 2 \leq x < 5.
\end{aligned}$$

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

$$S_2 = 1,12S_0.$$

$$S_2 > S_1 \Leftrightarrow 1,12S_0 > 1,1S_0 + 2000 \Leftrightarrow 0,02S_0 > 2000 \Leftrightarrow S_0 > 100000.$$

$$x_1 = 1,1 \cdot 80\,000 + 2000 = 90\,000 < 100\,000 :$$

$$x_2 = 1,1 \cdot 90\,000 + 2000 = 101\,000 :$$

$$x_3 = 1,12 \cdot 101\,000 = 113\,120 :$$

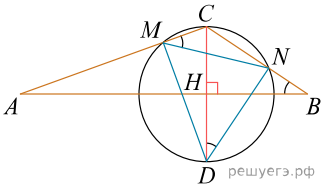
$$x_4 = 1,12 \cdot 113\,120 = 126\,694,4.$$

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |

$$\angle MDN = 180^{\circ} - \angle MCN = 180^{\circ} - \angle ACB = \angle CAB + \angle CBA.$$

$$\angle CMN = \angle CDN.$$



$$\angle CBH = \angle CDN = \angle CMN.$$

$$\frac{CN}{AC} = \frac{CM}{BC}.$$

$$\frac{2a}{27b} = \frac{2b}{3a}, \qquad \frac{a}{b} = 3.$$

$$\frac{CN}{AC} = \frac{2a}{27b} = \frac{2}{9}.$$

$$\frac{MN}{AB} = \frac{CN}{AC} = \frac{2}{9}.$$

---

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

$$(x - a^2 + 3a - 1) - (x - a^2 + a + 2) = 2a - 3.$$

$$m = x - a^2 + 3a - 1, n = x - a^2 + a + 2.$$

$$|m| + |n| = m - n.$$

$$n \leqslant 0 \leqslant m.$$

$$x - a^2 + a + 2 \leqslant 0 \leqslant x - a^2 + 3a - 1 \Leftrightarrow$$

$$\Leftrightarrow a^2 - 3a + 1 \leqslant x \leqslant a^2 - a - 2.$$

$$\begin{cases} a^2 - 3a + 1 \leqslant a^2 - a - 2, \\ \left[ \begin{array}{l} a^2 - a - 2 \leqslant 4, \\ a^2 - 3a + 1 \geqslant 19 \end{array} \right. \end{cases} \Leftrightarrow \begin{cases} 2a \geqslant 3, \\ \left[ \begin{array}{l} a^2 - a - 6 \leqslant 0, \\ a^2 - 3a - 18 \geqslant 0 \end{array} \right. \end{cases} \Leftrightarrow$$

$$\Leftrightarrow \begin{cases} a \geq 1,5, \\ (a-3)(a+2) \leq 0, \\ (a-6)(a+3) \geq 0 \end{cases} \Leftrightarrow \begin{cases} a \geq 1,5, \\ a \leq -3, \\ -2 \leq a \leq 3, \\ a \geq 6. \end{cases} \begin{cases} a^2-3a+1 \leq a^2-a-2, \\ a^2-a-2 \leq 4, \\ a^2-3a+1 \geq 19 \end{cases} \Leftrightarrow$$

$$\Leftrightarrow \begin{cases} 2a \geq 3, \\ a^2-a-6 \leq 0, \\ a^2-3a-18 \geq 0 \end{cases} \Leftrightarrow$$

$$\Leftrightarrow \begin{cases} a \geq 1,5, \\ (a-3)(a+2) \leq 0, \\ (a-6)(a+3) \geq 0 \end{cases} \Leftrightarrow \begin{cases} a \geq 1,5, \\ a \leq -3, \\ -2 \leq a \leq 3, \\ a \geq 6. \end{cases}$$

$$a \in [1,5;3] \cup [6;+\infty).$$

|  |  |
|--|--|
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

$$4k-8l+0\cdot m=-3(k+l+m).$$

$$40 < k+l+m < 48, \qquad k+l+m=44.$$

$$4k-8l=-3(k+l+m) \qquad 5l=7k+3m. \qquad m \geq 0, \qquad 5l \geq 7k, \qquad l > k.$$

$$k+l+m=44 \qquad 4k-8l=-3(k+l+m): 4k-8l=-132, \qquad k=2l-33.$$

$$k+l \leq 44, \qquad 3l-33 \leq 44, 3l \leq 77, l \leq 25, k=2l-33 \leq 17;$$

$$\frac{4\cdot 17-8\cdot 25}{44}=\frac{68-200}{44}=-3,$$