

**365.**

$$\begin{aligned} 1) \sqrt{\frac{64 \cdot 49}{196 \cdot 324}} &= \frac{8 \cdot 7}{14 \cdot 18} = \frac{2}{9}; & 2) \sqrt{5 \frac{4}{9} \cdot 11 \frac{14}{25}} &= \sqrt{\frac{49 \cdot 289}{9 \cdot 25}} = \frac{7 \cdot 17}{3 \cdot 5} = 7 \frac{14}{15} \\ 3) \sqrt{\frac{9}{16} \cdot \frac{4}{81} \cdot \frac{36}{169}} &= \frac{3 \cdot 2 \cdot 6}{4 \cdot 9 \cdot 13} = \frac{1}{13}; & 4) \sqrt{\frac{9}{16} \cdot 5^2} &= \frac{3}{4} \cdot 5 = 3 \frac{3}{4} \end{aligned}$$

**366.**

$$\begin{aligned} 1) \frac{3}{\sqrt{5}} &= \frac{3\sqrt{5}}{\sqrt{5}\sqrt{5}} = \frac{3\sqrt{5}}{5}; & 2) \frac{2}{\sqrt{6}} &= \frac{2\sqrt{6}}{\sqrt{6}\sqrt{6}} = \frac{2\sqrt{6}}{6} = \frac{\sqrt{6}}{3} \\ 3) \frac{1}{2-\sqrt{3}} &= \frac{2+\sqrt{3}}{(2-\sqrt{3})(2+\sqrt{3})} = \frac{2+\sqrt{3}}{4-3} = 2+\sqrt{3} \\ 4) \frac{1}{3+\sqrt{2}} &= \frac{3-\sqrt{2}}{(3+\sqrt{2})(3-\sqrt{2})} = \frac{3-\sqrt{2}}{9-2} = \frac{3-\sqrt{2}}{7} \\ 5) \frac{4}{\sqrt{7}-\sqrt{3}} &= \frac{4(\sqrt{7}+\sqrt{3})}{7-3} = \sqrt{7}+\sqrt{3}; & 6) \frac{3}{\sqrt{5}+\sqrt{2}} &= \frac{3(\sqrt{5}-\sqrt{2})}{5-2} = \sqrt{5}-\sqrt{2} \\ 7) \frac{\sqrt{5}-\sqrt{7}}{\sqrt{5}+\sqrt{7}} &= \frac{(\sqrt{5}-\sqrt{7})^2}{(\sqrt{5}+\sqrt{7})(\sqrt{5}-\sqrt{7})} = \frac{5-2\sqrt{35}+7}{5-7} = \frac{2(6-\sqrt{35})}{-2} = \sqrt{35}-6 \\ 8) \frac{\sqrt{10}+\sqrt{8}}{\sqrt{10}-\sqrt{8}} &= \frac{(\sqrt{10}+\sqrt{8})^2}{(\sqrt{10}-\sqrt{8})(\sqrt{10}+\sqrt{8})} = \frac{10+2\sqrt{80}+8}{10-8} = \frac{2(9+\sqrt{80})}{2} = 9+4\sqrt{5} \end{aligned}$$

**367.** Вычисляется на калькуляторе.

**368.**

$$S = 72 \text{ см}^2, S = 2 \text{ см}^2; \frac{a_1}{a_2} = \frac{\sqrt{72}}{\sqrt{2}} = \sqrt{\frac{72}{2}} = \sqrt{36} = 6$$

Ответ: в 6 раз больше.

**369.**

$$\begin{aligned} 1) \sqrt{\frac{25a^6}{49}} &= \frac{5|a^3|}{7} = \begin{cases} \frac{5a^3}{7}, & \text{если } a \geq 0 \\ -\frac{5a^3}{7}, & \text{если } a < 0 \end{cases}; & 2) \sqrt{\frac{121x^4}{64}} &= \frac{11x^2}{8} \\ 3) \sqrt{\frac{1}{4a^2}} &= \begin{cases} \frac{1}{2a}, & \text{при } a > 0 \\ -\frac{1}{2a}, & \text{при } a < 0 \end{cases}; & 4) \sqrt{\frac{400}{a^2}} &= \frac{20}{|a|} = \frac{-20}{a}, \text{ т.к. } a < 0. \end{aligned}$$

**370.**

$$1) (x-3)\sqrt{\frac{1}{x^2-6x+9}} = (x-3) \cdot \frac{1}{|x-3|} \quad 2) (2-a)\sqrt{\frac{1}{a^2-4a+4}} = (2-a) \cdot \frac{1}{|a-2|}$$

$$\text{при } x > 3, \text{ получаем } \frac{x-3}{x-3} = 1 \quad \text{при } a > 2, \text{ получаем } \frac{2-a}{a-2} = -1$$

$$\text{при } x < 3, \text{ получаем } \frac{x-3}{3-x} = -1 \quad \text{при } a < 2, \text{ получаем } \frac{2-a}{2-a} = 1$$

**371.**

$$1) \frac{3}{2+\sqrt{6}} + \frac{3}{2-\sqrt{6}} = \frac{3(2-\sqrt{6}) + 3(2+\sqrt{6})}{(2+\sqrt{6})(2-\sqrt{6})} = \frac{12}{4-6} = -6$$

$$2) \frac{5}{3-\sqrt{11}} + \frac{5}{3+\sqrt{11}} = \frac{5(3+\sqrt{11}) + 5(3-\sqrt{11})}{(3-\sqrt{11})(3+\sqrt{11})} = \frac{30}{9-11} = -15$$

$$3) \frac{2}{\sqrt{11}-3} - \frac{7}{\sqrt{11}-2} = \frac{2(\sqrt{11}+3)}{11-9} - \frac{7(\sqrt{11}+2)}{11-4} = \sqrt{11}+3-\sqrt{11}-2=1$$

$$4) \frac{3}{3+\sqrt{6}} + \frac{2}{2+\sqrt{6}} = \frac{3(3-\sqrt{6})}{9-6} + \frac{2(2-\sqrt{6})}{4-6} = 3-\sqrt{6}-2+\sqrt{6}=1$$

$$5) \frac{3}{\sqrt{7}-2} - \frac{2}{\sqrt{7}+3} - \sqrt{7} = \frac{3(\sqrt{7}+2)}{7-4} - \frac{2(\sqrt{7}-3)}{7-9} - 2\sqrt{7} = \\ = \sqrt{7}+2+\sqrt{7}-3-2\sqrt{7} = -1$$

$$6) \frac{1}{3-\sqrt{5}} + \frac{1}{2-\sqrt{5}} + \frac{3\sqrt{5}}{4} = \frac{3+\sqrt{5}}{9-5} + \frac{2+\sqrt{5}}{4-5} + \frac{3\sqrt{5}}{4} = \\ = \frac{3}{4} + \frac{\sqrt{5}}{4} - 2 - \sqrt{5} + \frac{3\sqrt{5}}{4} = -1\frac{1}{4}$$

**372.**

$$\text{Нужно доказать, что } \frac{1}{2} \left( \sqrt{\frac{a}{b}} + \sqrt{\frac{b}{a}} \right) \geq 1$$

Правая часть неравенства – это среднее арифметическое  $\sqrt{\frac{a}{b}}$  и

$\sqrt{\frac{b}{a}}$ , а левая – это среднее геометрическое (т.к.  $\sqrt{\frac{a}{b} \cdot \frac{b}{a}} = 1$ ). Значит

данное неравенство есть прямое следствие из неравенства между средним арифметическим и средним геометрическим.

373.

$$\begin{aligned}
 1) \quad \frac{a-b}{\sqrt{a}-\sqrt{b}} - \sqrt{b} &= \frac{(\sqrt{a}-\sqrt{b})(\sqrt{a}+\sqrt{b})}{(\sqrt{a}-\sqrt{b})} - \sqrt{b} = \sqrt{a} \\
 2) \quad 2(\sqrt{x}+\sqrt{y}) - \frac{x-y}{\sqrt{x}+\sqrt{y}} &= 2\sqrt{x}+2\sqrt{y} - \frac{(\sqrt{x}-\sqrt{y})(\sqrt{x}+\sqrt{y})}{(\sqrt{x}+\sqrt{y})} = \\
 &= 2\sqrt{x}+2\sqrt{y}-\sqrt{x}+\sqrt{y} = \sqrt{x}+3\sqrt{y}
 \end{aligned}$$

375.

1) Доказать:

$$\sqrt{ab} \geq \frac{2}{\frac{1}{a} + \frac{1}{b}}$$

при  $a > 0, b > 0$

$$\begin{aligned}
 \sqrt{ab} - \frac{2}{\frac{1}{a} + \frac{1}{b}} &= \sqrt{ab} - \frac{2ab}{a+b} = \\
 &= \frac{\sqrt{ab} \cdot (a+b) - 2ab}{a+b} = \frac{\sqrt{ab}(a-2\sqrt{ab}+b)}{a+b} = \frac{\sqrt{ab} \cdot (\sqrt{a}-\sqrt{b})^2}{a+b} \geq 0,
 \end{aligned}$$

т.к.  $a+b > 0, \sqrt{ab} > 0, (\sqrt{a}-\sqrt{b})^2 \geq 0$ .

$$\text{Значит, } \sqrt{ab} \geq \frac{2}{\frac{1}{a} + \frac{1}{b}}$$

2) Доказать:

$$\sqrt{\frac{a^2}{b}} + \sqrt{\frac{b^2}{a}} \geq \sqrt{a} + \sqrt{b}$$

при  $a > 0, b > 0$

$$\begin{aligned}
 \sqrt{\frac{a^2}{b}} + \sqrt{\frac{b^2}{a}} - (\sqrt{a} + \sqrt{b}) &= \frac{a\sqrt{a} + b\sqrt{b} - a\sqrt{b} - b\sqrt{a}}{\sqrt{ab}} = \\
 \frac{\sqrt{a}(a-b) + \sqrt{b}(b-a)}{\sqrt{ab}} &= \frac{(\sqrt{a}-\sqrt{b})(a-b)}{\sqrt{ab}} = \frac{(\sqrt{a}-\sqrt{b})^2 \cdot (\sqrt{a}+\sqrt{b})}{\sqrt{ab}},
 \end{aligned}$$

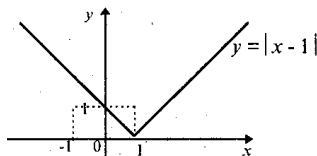
т.к.  $(\sqrt{a}-\sqrt{b})^2 > 0, \sqrt{a}+\sqrt{b} > 0, \sqrt{ab} > 0$ .

$$\text{Значит, } \sqrt{\frac{a^2}{b}} + \sqrt{\frac{b^2}{a}} \geq \sqrt{a} + \sqrt{b}$$

**376.**

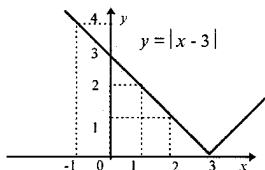
$$1) y = \sqrt{x^2 - 2x + 1} = \sqrt{(x-1)^2}$$

$$y = |x-1| = \begin{cases} x-1, & \text{если } x \geq 1 \\ 1-x, & \text{если } x < 1 \end{cases}$$



$$2) y = \sqrt{x^2 - 6x + 9} = \sqrt{(x-3)^2}$$

$$y = |x-3| = \begin{cases} x-3, & \text{если } x \geq 3 \\ 3-x, & \text{если } x < 3 \end{cases}$$



**377.**

$$1) (\sqrt{3})^2 = 3 \quad 2) (\sqrt{0,1})^2 = 0,1 \quad 3) \left(\sqrt{\frac{5}{12}}\right)^2 = \frac{5}{12} \quad 4) \left(\sqrt{3\frac{1}{3}}\right)^2 = 3\frac{1}{3}$$

**378.**

$$1) \sqrt{17} < \sqrt{82} \quad 2) \sqrt{0,2} < \sqrt{0,3} \quad 3) 3 < \sqrt{10}, \quad 4) 5 > \sqrt{24}, \text{ т.к.}$$

$$\text{т.к. } 3 = \sqrt{9} \quad 5 = \sqrt{25}$$

**379.**

$$1) \sqrt{21 \cdot 6 \cdot 7 \cdot 8} = \sqrt{3 \cdot 7 \cdot 3 \cdot 2 \cdot 7 \cdot 2 \cdot 4} = 3 \cdot 7 \cdot 2 \cdot 2 = 84$$

$$2) \sqrt{72 \cdot 6 \cdot 45 \cdot 15} = \sqrt{9 \cdot 8 \cdot 6 \cdot 9 \cdot 5 \cdot 5 \cdot 3} = 3 \cdot 4 \cdot 5 \cdot 9 = 540$$

$$3) \sqrt{225 \cdot 0,16 \cdot 400} = 15 \cdot 0,4 \cdot 20 = 120; \quad 4) \sqrt{900 \cdot 25 \cdot 1,69} = 30 \cdot 5 \cdot 1,3 = 195$$

**380.**

$$1) \sqrt{7} \cdot \sqrt{63} = \sqrt{7 \cdot 7 \cdot 9} = 7 \cdot 3 = 21; \quad 2) \sqrt{8} \cdot \sqrt{98} = \sqrt{4 \cdot 2 \cdot 49 \cdot 2} = 2 \cdot 2 \cdot 7 = 28$$

$$3) \sqrt{75} \cdot \sqrt{3} = \sqrt{25 \cdot 3 \cdot 3} = 5 \cdot 3 = 15; \quad 4) \sqrt{10} \cdot \sqrt{40} = \sqrt{400} = 20$$

**381.**

$$1) \frac{4\sqrt{72}}{3\sqrt{8}} = \frac{4}{3} \sqrt{\frac{72}{8}} = \frac{4}{3} \cdot 3 = 4; \quad 2) \frac{2\sqrt{63}}{\sqrt{28}} = 2\sqrt{\frac{63}{28}} = 2\sqrt{\frac{9}{4}} = 3$$

$$3) \frac{2\sqrt{45}}{\sqrt{80}} = 2\sqrt{\frac{45}{80}} = 2\sqrt{\frac{9}{16}} = 1,5; \quad 4) \frac{4\sqrt{99}}{9\sqrt{44}} = \frac{4}{9} \sqrt{\frac{99}{44}} = \frac{4}{9} \sqrt{\frac{9}{4}} = \frac{2}{3}$$

**382.**

$$1) \sqrt{2^8} = 2^4 = 16; \quad 2) \sqrt{3^6} = 3^3 = 27; \quad 3) \sqrt{5^4} = 5^2 = 25$$

$$4) \sqrt{6^6} = 6^3 = 216; \quad 5) \sqrt{(-3)^6} = |-3^3| = 27; \quad 6) \sqrt{(-7)^4} = |-7^2| = 49$$

**383.**

$$1) 3\sqrt{20} + \sqrt{28} + \sqrt{45} - \sqrt{63} = 6\sqrt{5} + 2\sqrt{7} + 3\sqrt{5} - 3\sqrt{7} = 9\sqrt{5} - \sqrt{7}$$

$$2) \left( 2\sqrt{\frac{2}{3}} - 8\sqrt{\frac{3}{8}} + 3\sqrt{\frac{3}{2}} \right) \cdot 3\sqrt{\frac{3}{2}} = 6 - 24\frac{3}{4} + 9\frac{3}{2} = 1,5$$

$$3) (6\sqrt{45} - 3\sqrt{20} + 9\sqrt{80}) : (3\sqrt{5}) = (18\sqrt{5} - 6\sqrt{5} + 36\sqrt{5}) : 3\sqrt{5} = 6 - 2 + 12 = 16.$$

$$4) (7\sqrt{8} - 14\sqrt{18} + 0,7\sqrt{12}) : (7\sqrt{2}) = (14\sqrt{2} - 42\sqrt{2} + 1,4\sqrt{3}) : 7\sqrt{2} = (-28\sqrt{2} + 1,4\sqrt{3}) : 7\sqrt{2} = -4 + 0,2\frac{\sqrt{3}}{\sqrt{2}} = -4 + 0,1\sqrt{6}$$

$$5) \frac{5}{1+\sqrt{6}} + \frac{6}{3+\sqrt{6}} = \frac{5(1-\sqrt{6})}{1-6} + \frac{6(3-\sqrt{6})}{9-6} = \sqrt{6} - 1 + 2(3-\sqrt{6}) = \sqrt{6} - 1 + 6 - 2\sqrt{6} = 5 - \sqrt{6}$$

$$6) \frac{6}{\sqrt{2}-\sqrt{3}} - \frac{4}{\sqrt{2}+\sqrt{3}} = \frac{6(\sqrt{2}+\sqrt{3}) - 4(\sqrt{2}-\sqrt{3})}{(\sqrt{2}-\sqrt{3})(\sqrt{2}+\sqrt{3})} = \frac{2\sqrt{2}+10\sqrt{3}}{2-3} = -2\sqrt{2}-10\sqrt{3}$$

**384.**

$$1) \frac{5a^2-35}{a-\sqrt{7}} = \frac{5 \cdot (a^2-7)}{a-\sqrt{7}} = \frac{5(a-\sqrt{7})(a+\sqrt{7})}{a-\sqrt{7}} = 5(a+\sqrt{7})$$

$$2) \frac{x^3-3x}{x+\sqrt{3}} = \frac{x(x-3)}{x+\sqrt{3}} = \frac{x(x-\sqrt{3})(x+\sqrt{3})}{x+\sqrt{3}} = x(x-\sqrt{3})$$

$$3) \frac{5x-5\sqrt{3}}{3-x^2} = \frac{5(x-\sqrt{3})}{(\sqrt{3}-x)(\sqrt{3}+x)} = -\frac{5}{x+\sqrt{3}}$$

$$4) \frac{4\sqrt{a}+\sqrt{b}}{b-16a} = \frac{4\sqrt{a}+\sqrt{b}}{(\sqrt{b}-4\sqrt{a})(\sqrt{b}+4\sqrt{a})} = \frac{1}{\sqrt{b}-4\sqrt{a}}$$

$$5) \frac{\sqrt{15}-5}{\sqrt{6}-\sqrt{10}} = \frac{\sqrt{5}(\sqrt{3}-\sqrt{5})}{\sqrt{2}(\sqrt{3}-\sqrt{5})} = \frac{\sqrt{5}}{\sqrt{2}} = \frac{\sqrt{10}}{2}$$

$$6) \frac{9-2\sqrt{3}}{3\sqrt{6}-2\sqrt{2}} = \frac{\sqrt{3}(3\sqrt{3}-2)}{\sqrt{2}(3\sqrt{3}-2)} = \frac{\sqrt{3}}{\sqrt{2}} = \frac{\sqrt{6}}{2}$$

**385.**

$$1) \sqrt{x-1} = 4$$

$$x-1 = 16; x = 17$$

$$2) \sqrt{x+9} = 5$$

$$x+9 = 25; x = 16$$

$$3) \sqrt{2(x-1)} = 2;$$

$$2(x-1) = 4; x-1 = 2; x = 3$$

$$4) \sqrt{2x-7} = 1$$

$$2x-7 = 1; x = 4$$

**386.**

$$1) |x-2| = x-2; x-2 \geq 0; x \geq 2 \quad 2) |3-x| = x-3; x-3 \geq 0; x \geq 3.$$

$$\text{Ответ: } x \geq 2$$

$$\text{Ответ: } x \geq 3$$

$$3) \sqrt{(x+3)^2} = x+3; x+3 \geq 0 \quad 4) \sqrt{(5-2x)^2} = 2x-5; 2x-5 \geq 0$$

$$|x+3| = x+3; x \geq -3$$

$$|5-2x| = 2x-5; x \geq 2,5.$$

$$\text{Ответ: } x \geq -3$$

$$\text{Ответ: } x \geq 2,5$$

**387.**

$$1) y = \sqrt{x^2-2x+1} + \sqrt{x^2-6x+9} = \sqrt{(x-1)^2} + \sqrt{(x-3)^2} = |x-1| + |x-3|$$

$$a) x < 1, y = 1 - x + 3 - x = 4 - 2x$$

$$б) 1 \leq x \leq 3, y = x - 1 + 3 - x = 2$$

$$в) x > 3, y = x - 1 + x - 3 = 4x - 4$$

$$2) y = \sqrt{a^2-4a+4} + \sqrt{a^2-10a+25} = \sqrt{(a-2)^2} + \sqrt{(a-5)^2} = |a-2| + |a-5|$$

$$a) a < 2, y = 2 - a + 5 - a = 7 - 2a; б) 2 \leq a \leq 5, y = a - 2 + 5 - a = 3$$

$$в) a > 5, y = a - 2 + a - 5 = 2a - 7$$

**388.**

$$2x^2 - 5ax + 2a^2, x = \sqrt{6} + \sqrt{5}, a = \sqrt{6} - \sqrt{5}$$

$$2(\sqrt{6} + \sqrt{5})^2 - 5(\sqrt{6} - \sqrt{5})(\sqrt{6} + \sqrt{5}) + 2(\sqrt{6} - \sqrt{5})^2 = 2(6 + 2\sqrt{30} + 5) - 5(6 - 5) + 2(6 - 2\sqrt{30} + 5) = 12 + 4\sqrt{30} + 10 - 5 + 12 - 4\sqrt{30} + 10 = 39$$

**389.**

$$1) \left( \sqrt{ab} - \frac{ab}{a + \sqrt{ab}} \right) : \frac{a^2b}{a-b} = \frac{a\sqrt{ab} + ab - ab}{\sqrt{a}(\sqrt{a} + \sqrt{b})} \cdot \frac{(\sqrt{a} - \sqrt{b})(\sqrt{a} + \sqrt{b})}{a^2b} =$$

$$= \frac{\sqrt{ab} \cdot (\sqrt{a} - \sqrt{b})}{\sqrt{ab} \cdot a\sqrt{b}} = \frac{\sqrt{a} - \sqrt{b}}{a\sqrt{b}}$$

$$2) \left( \frac{a + \sqrt{b}}{a - \sqrt{b}} + \frac{a - \sqrt{b}}{a + \sqrt{b}} \right) \cdot \frac{a - \sqrt{b}}{a^2 + b} = \frac{(a^2 + 2a\sqrt{b} + b + a^2 - 2a\sqrt{b} + b)(a - \sqrt{b})}{(a - \sqrt{b})(a + \sqrt{b})(a^2 + b)} =$$

$$= \frac{2(a^2 + b)}{(a + \sqrt{b})(a^2 + b)} = \frac{2}{a + \sqrt{b}}$$

$$\begin{aligned}
 3) & \left( \frac{c - \sqrt{d}}{c + \sqrt{d}} - \frac{c + \sqrt{d}}{c - \sqrt{d}} \right) : \frac{2c\sqrt{d}}{c + \sqrt{d}} = \frac{(c^2 - 2c\sqrt{d} + d - c^2 - 2c\sqrt{d} - d)}{(c + \sqrt{d})(c - \sqrt{d})} \cdot \\
 & \cdot \frac{(c + \sqrt{d})}{2c\sqrt{d}} = \frac{-4c\sqrt{d}}{(c - \sqrt{d}) \cdot 2c\sqrt{d}} = \frac{-2}{c - \sqrt{d}} = \frac{2}{\sqrt{d} - c} \\
 4) & (2 + \sqrt{b}) \left( \frac{2}{\sqrt{b} + 2} - \frac{2}{2 - \sqrt{b}} + \frac{2b}{4 - b} \right) = (2 + \sqrt{b}) \frac{2(2 - \sqrt{b}) - 2(2 + \sqrt{b}) + 2b}{(2 - \sqrt{b})(2 + \sqrt{b})} = \\
 & = \frac{4 - 2\sqrt{b} - 4 - 2\sqrt{b} + 2b}{2 - \sqrt{b}} = \frac{2b - 4\sqrt{b}}{2 - \sqrt{b}} = \frac{2\sqrt{b}(\sqrt{b} - 2)}{2 - \sqrt{b}} = -2\sqrt{b}
 \end{aligned}$$

**390.**

Если  $x$  и  $y$  данные числа, то

$$\begin{cases} x + y = \sqrt{14} & | (x + y)^2 = 14 & | x^2 + 2xy + y^2 = 14 \\ x - y = \sqrt{10} & | (x - y)^2 = 10 & | x^2 - 2xy + y^2 = 10 \end{cases}$$

$$\text{Имеем: } x^2 + 2xy + y^2 - (x^2 - 2xy + y^2) = 14 - 10$$

$$4xy = 4, xy = 1, \text{ ч.т.д.}$$

**391.**

$$\begin{aligned}
 1) & \sqrt{xy} \cdot \left( \frac{x}{y} \sqrt{xy} - 2\sqrt{\frac{y}{x}} - \sqrt{\frac{1}{xy}} \right) = \frac{x}{y} \cdot xy - 2y - 1 = x^2 - 2y - 1 \\
 2) & \left( \frac{a}{b} \sqrt{\frac{1}{ab}} - \frac{1}{b} \sqrt{\frac{a}{b}} - b \sqrt{\frac{b}{a}} \right) : \sqrt{ab} = \frac{a}{b} \cdot \frac{1}{ab} - \frac{1}{b} \cdot \frac{1}{b} - b \cdot \frac{1}{a} = \frac{1}{b^2} - \frac{1}{b^2} - \frac{b}{a} = -\frac{b}{a}
 \end{aligned}$$

**392.**

$$\begin{aligned}
 1) & \frac{1}{\sqrt{3} - \sqrt{2}} = \frac{1(\sqrt{3} + \sqrt{2})}{(\sqrt{3} - \sqrt{2})(\sqrt{3} + \sqrt{2})} = \frac{\sqrt{3} + \sqrt{2}}{3 - 2} = \sqrt{3} + \sqrt{2} \\
 2) & \frac{2}{\sqrt{11} - \sqrt{3}} = \frac{2(\sqrt{11} + \sqrt{3})}{11 - 3} = \frac{\sqrt{11} + \sqrt{3}}{4} \\
 3) & \frac{\sqrt{7} + \sqrt{5}}{\sqrt{7} - \sqrt{5}} = \frac{(\sqrt{7} + \sqrt{5})(\sqrt{7} + \sqrt{5})}{(\sqrt{7} - \sqrt{5})(\sqrt{7} + \sqrt{5})} = \frac{7 + 2\sqrt{35} + 5}{7 - 5} = 6 + \sqrt{35} \\
 4) & \frac{5 - 4\sqrt{5}}{5\sqrt{3} - 9} = \frac{(5 - 4\sqrt{5})(5\sqrt{3} + 9)}{(5\sqrt{3} - 9)(5\sqrt{3} + 9)} = \frac{25\sqrt{3} + 45 - 60 - 36\sqrt{3}}{75 - 81} = \\
 & = \frac{15 + 11\sqrt{3}}{6}
 \end{aligned}$$

**393.**

$$(\sqrt{a} - \sqrt{b})^2 \geq 0; a - 2\sqrt{ab} + b \geq 0$$

$$a - \sqrt{ab} + b - \sqrt{ab} \geq 0; a - \sqrt{ab} + b \geq \sqrt{ab}, \quad \text{ч.т.д.}$$

**397.**

$$\text{Т.к. } a, b > 0, \text{ то } \frac{(a-b)^2}{ab} \geq 0$$

$$\frac{a^2 - 2ab + b^2}{ab} \geq 0, \quad \frac{a^2 - 2ab + b^2 - 4ab}{ab} \geq 0,$$

$$\frac{(a+b)(a+b)}{ab} - 4 \geq 0, \quad (a+b)\left(\frac{1}{a} + \frac{1}{b}\right) \geq 4, \quad \text{ч.т.д.}$$

**398.**

Если  $a + b < 0$ , то неравенство очевидно.

$$\text{Рассмотрим случай } a + b \geq 0. \text{ Заметим, что } \frac{-(a-b)^2}{4} \leq 0$$

$$-\frac{(a^2 - 2ab + b^2)}{4} \leq 0, \quad \frac{a^2 + 2ab + b^2 - 2a^2 - 2b^2}{4} \leq 0,$$

$$\frac{(a+b)^2}{4} \leq \frac{a^2 + b^2}{2}, \quad \sqrt{\frac{(a+b)^2}{4}} \leq \sqrt{\frac{a^2 + b^2}{2}},$$

$$\frac{|a+b|}{2} \leq \sqrt{\frac{a^2 + b^2}{2}}, \quad \frac{a+b}{2} \leq \sqrt{\frac{a^2 + b^2}{2}}$$

**399.**

$$1) y = \sqrt{x^2 - 8x + 16} + \sqrt{x^2 - 12x + 36} = \sqrt{(x-4)^2} + \sqrt{(x-6)^2} = \\ = |x-4| + |x-6|$$

$$\text{при } x < 4, y = 4 - x + (-x) + 6 = 10 - 2x$$

$$\text{при } 4 \leq x \leq 6, y = x - 4 + 6 - x = 2; \text{ при } x > 6, y = x - 4 + x - 6 = 2x - 10$$

$$2) y = \sqrt{4x^2 - 4x + 1} + \sqrt{9x^2 - 6x + 1} = |2x-1| + |3x-1|$$

$$\text{при } x < \frac{1}{3}, y = 1 - 2x + 1 - 3x = 2 - 5x$$

$$\text{при } \frac{1}{3} \leq x \leq \frac{1}{2}, y = -2x + 1 - 1 + 3x = x$$

$$\text{при } x > \frac{1}{2}, y = 2x - 1 + 3x - 1 = 5x - 2$$



**400.**

Т.к.  $a, b \geq 0$ , то  $a + b < a + 2\sqrt{ab} + b$ ,  $a + b < (\sqrt{a} + \sqrt{b})^2$ ,  
 $\sqrt{a+b} < \sqrt{(\sqrt{a} + \sqrt{b})^2}$ ;  $\sqrt{a+b} < \sqrt{a} + \sqrt{b}$ .

## Квадратные уравнения

**401, 402.** Устно.

**403.**

1)  $2x^2 + 3x + 4 = 0$ ; 2)  $-x^2 + 9 = 0$ ; 3)  $x^2 - 5x = 0$ ; 4)  $x^2 = 0$ .

**404.**

1)  $x(x-3) = 4$ ;  $x^2 - 3x - 4 = 0$  2)  $(x-3)(x-1) = 12$ ;  $x^2 - 4x - 9 = 0$   
3)  $3x(x-5) = x(x+1) - x^2$  4)  $7(x^2-1) = 2(x+2)(x-2)$   
 $3x^2 - 15x = x^2 + x - x^2$   $7x^2 - 7 = 2(x^2 - 4)$   
 $3x^2 - 16x = 0$   $5x^2 + 1 = 0$

**405.**

1)  $x^2 - 9 = 0$ ;  $x_1 = -3$  – корень  
2)  $x^2 - x = 0$ ;  $x_1 = 0$ ;  $x_2 = 1$  – корень  
3)  $x^2 + x - 6 = 0$ ;  $x_1 = -3$  – корень  
4)  $(x-1)(x+2) = 0$ ;  $x_1 = -2$ ;  $x_2 = 1$  – корень  
5)  $x^2 - 5x + 4 = 0$ ;  $x_1 = 1$  – корень  
6)  $(x+1)(x-3) = x$ ; ни одно из чисел.

**406.**

$x^2 = 36$ .  $x_1 = 6$ ;  $x_2 = -6$ , арифметический корень из 36:  $\sqrt{36} = 6$ .

**407.**

1) $x^2 = 1$	2) $x^2 = 9$	3) $x^2 = 16$
$x_{1,2} = \pm 1$	$x_{1,2} = \pm 3$	$x_{1,2} = \pm 4$
4) $x^2 = 25$	5) $x^2 = 100$	6) $x^2 = 0$
$x_{1,2} = \pm 5$	$x_{1,2} = \pm 10$	$x = 0$

**408.**

1) $x^2 = \frac{9}{16}$ ; $x_{1,2} = \pm \frac{3}{4}$ ;	2) $x^2 = \frac{16}{49}$ ; $x_{1,2} = \pm \frac{4}{7}$ ;
3) $x^2 = 1\frac{7}{9}$ ; $x_{1,2} = \pm \frac{4}{3}$ ;	4) $x^2 = 2\frac{1}{4}$ ; $x_{1,2} = \pm \frac{3}{2}$ ;
5) $x^2 = 5$ ; $x_{1,2} = \pm \sqrt{5}$ ;	6) $x^2 = 13$ ; $x_{1,2} = \pm \sqrt{13}$ .

**409.**

1)  $x^2 - 49 = 0$

$x^2 = 49$

$x = +7$  или  $x = -7$

2)  $x^2 - 121 = 0$

$x^2 = 121$

$x = +11$  или  $x = -11$

3)  $\frac{1}{3}x^2 = 0$

$x = 0$

4)  $\frac{x^2}{5} = 0$ ;  $x = 0$

5)  $x^2 + 9 = 0$

$x^2 = -9$  – нет корней

6)  $x^2 + 12 = 0$

$x^2 = -12$  – нет корней

**410.**

1)  $x^2 - x = 0$

$x(x - 1) = 0$

$x = 0$  или  $x = 1$

2)  $x^2 + 2x = 0$

$x(x + 2) = 0$

$x = 0$  или  $x = -2$

3)  $3x^2 + 5x = 0$

$x(3x + 5) = 0$

$x = 0$  или  $x = -1\frac{2}{3}$

4)  $5x^2 - 3x = 0$

$x(5x - 3) = 0$

$x = 0$  или  $x = \frac{3}{5}$

5)  $x^2 - 4x + 4 = 0$

$(x - 2)^2 = 0$

$x = 2$

6)  $x^2 + 6x + 9 = 0$

$(x + 3) = 0$

$x = -3$

**412.**

1)  $(x - 2)(x^2 + 2x + 4) - x^2(x - 18) = 0$

$x^3 - 8 - x^3 + 18x^2 = 0$

$18x^2 = 8$ ;  $x^2 = \frac{4}{9}$

$x = \frac{2}{3}$  или  $x = -\frac{2}{3}$

2)  $(x + 1)(x^2 - x + 1) - x^2(x + 4) = 0$

$x^3 + 1 - x^3 - 4x^2 = 0$

$4x^2 = 1$ ;  $x^2 = \frac{1}{4}$

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

**413.**Т.к.  $\sqrt{x^2} = |x|$ , то уравнения  $x^2 = 4$  и  $|x| = 2$  равносильны**414.**

1)  $x^2 + bx + 4 = 0$ ,  $b = -4$  или  $b = 4$

$x^2 - 4x + 4 = 0$ ;

$(x - 2)^2 = 0$ ;  $x_1 = 2$

$x^2 + 4x + 4 = 0$

$(x + 2)^2 = 0$ ;  $x_1 = -2$

2)  $x^2 - bx + 9 = 0$ ,  $b = -6$  или  $b = 6$

$x^2 + 6x + 9 = 0$ ;

$(x + 3)^2 = 0$ ;  $x = -3$

$x^2 - 6x + 9 = 0$ ;

$(x - 3)^2 = 0$   $x = 3$

3)  $x^2 - 8x + b = 0$ ,  $b = 16$ ;

4)  $x^2 + \frac{2}{3}x + b = 0$ ,  $b = \frac{1}{9}$

$x^2 - 8x + 16 = 0$

$x^2 + \frac{2}{3}x + \frac{1}{9} = 0$ ;  $\left(x + \frac{1}{3}\right)^2 = 0$ ;  $x = -\frac{1}{3}$

$(x - 4)^2 = 0$ ;  $x = 4$ .

**415.**

1)  $x^2 + 4x + 3 = 0$

$x^2 + 4x + 4 - 1 = 0; (x + 1)^2 = 1$

$x + 2 = 1$  или  $x + 2 = -1$

$x_1 = -1; x_2 = -3$

2)  $x^2 + 3x + 2 = 0$

$x^2 + 3x + 2,25 - 0,25 = 0$

$(x - 1,5)^2 = 0,25; x - 1,5 = 0,5$

или  $x + 1,5 = -0,5; x_1 = 1; x_2 = -2$

**416.**

$ax_0^2 + bx_0 + c = 0$ , т.к.  $x_0$  – корень уравнения

$ax^2 + bx + c = 0$ , т.к.  $c \neq 0$ , то  $x_0 \neq 0$

Доказательство:

Имеем:  $a + \frac{b}{x_0} + \frac{c}{x_0^2} = 0$ ;  $c \cdot \left(\frac{1}{x_0}\right)^2 + b \cdot \frac{1}{x_0} + a = 0$

Значит,  $\frac{1}{x_0}$  – корень уравнения  $cx^2 + bx + a = 0$ .

**417.**

1)  $x^2 = 0$

$x = 0$

4)  $9x^2 = 81$

$x^2 = 9$

$x = +3$  или  $x = -3$

7)  $4x^2 = 81$

$x^2 = \frac{81}{4}; x = +\frac{9}{2}$  или  $x = -\frac{9}{2}$

2)  $3x^2 = 0$

$x = 0$

5)  $4x^2 - 64 = 0$

$(2x - 8)(2x + 8) = 0$

$x = 4$  или  $x = -4$

3)  $5x^2 = 125$

$x^2 = 25; x = +5$  или  $x = -5$

6)  $x^2 - 27 = 0$

$(x - 3\sqrt{3})(x + 3\sqrt{3}) = 0$

$x = 3\sqrt{3}$  или  $x = -3\sqrt{3}$

8)  $0,01x^2 = 4$

$x^2 = 400$

$x = +20$  или  $x = -20$

**418.**

1)  $x^2 - 7x = 0$

$x(x - 7) = 0$

$x = 0$  или  $x = 7$

4)  $4x^2 = 0,16x$

$x(4x - 0,16) = 0$

$x = 0$  или  $x = 0,04$

2)  $x^2 + 5x = 0$

$x(x + 5) = 0$

$x = 0$  или  $x = -5$

5)  $9x^2 - x = 0$

$x(9x - 1) = 0$

$x = 0$  или  $x = \frac{1}{9}$

3)  $5x^2 = 3x; 5x^2 - 3x = 0;$

$x(5x - 3) = 0; x = 0$  или  $x = \frac{3}{5}$

6)  $9x^2 + 1 = 0$

$x^2 = -\frac{1}{9}$  – нет корней

нет решений

**419.**

1)  $4x^2 - 169 = 0$

$x^2 = \frac{169}{4}$

$x = 6,5$  или  $x = -6,5$

2)  $25 - 16x^2 = 0$

$x^2 = \frac{25}{16}$

$x = 1\frac{1}{4}$  или  $x = -1\frac{1}{4}$

3)  $2x^2 - 16 = 0; x^2 - 8 = 0$

$x = +2\sqrt{2}$

или  $x = -2\sqrt{2}$

$$4) 3x^2 = 15 \quad 5) 2x^2 = \frac{1}{8}; x^2 = \frac{1}{16}; \quad 6) 3x^2 = 5\frac{1}{3}; x^2 = \frac{16}{9}$$

$$x^2 = 5; x = +\sqrt{5}$$

$$\text{или } x = -\sqrt{5}$$

$$x_{1,2} = +\frac{1}{4} \text{ или } x = -\frac{1}{4} \quad x = \frac{4}{3} \text{ или } x = -\frac{4}{3}$$

**420.**

$$1) \frac{x^2 - 1}{3} = 5; x^2 - 1 = 15; x^2 = 16 \quad 2) \frac{9 - x^2}{5} = 1; 9 - x^2 = 5; x^2 = 4$$

$$x = +4 \text{ или } x = -4 \quad x = +2 \text{ или } x = -2$$

$$3) 4 = \frac{x^2 - 5}{5} \quad 4) 3 = \frac{9x^2 - 4}{4}; 9x^2 - 4 = 12;$$

$$20 = x^2 - 5; x^2 = 25 \quad x^2 = \frac{16}{9}; x = +\frac{4}{3} \text{ или } x = -\frac{4}{3}$$

$$x = +5 \text{ или } x = -5$$

**421.**

$$1) 3x^2 + 6x = 8x^2 - 15x \quad 2) 17x^2 - 5x = 14x^2 + 7x$$

$$5x^2 - 21x = 0; x(5x - 21) = 0 \quad 3x^2 - 12x = 0; 3x(x - 4) = 0$$

$$x = 4,2 \text{ или } x = 0 \quad x = 4 \text{ или } x = 0$$

$$3) 10x + 7x^2 = 2x^2 + 8x \quad 4) 15x + 9x^2 = 7x^2 + 10$$

$$5x^2 + 2x = 0; x(5x + 2) = 0 \quad 2x^2 + 5x = 0; x(2x + 5) = 0$$

$$x = -0,4 \text{ или } x = 0 \quad x = -2,5 \text{ или } x = 0$$

**422.**

$$1) \frac{4x^2 - 3x}{3} = \frac{x^2 + 5x}{2} \quad 2) \frac{3x^2 + 7x}{4} = \frac{7x^2 - 5x}{3}$$

$$2(4x^2 - 3x) = 3(x^2 + 5x) \quad 9x^2 + 21x = 28x^2 - 20x$$

$$8x^2 - 6x = 3x^2 + 15x \quad 19x^2 - 41x = 0; x(19x - 41) = 0$$

$$5x^2 - 21x = 0; x(5x - 21) = 0 \quad x = 2\frac{3}{19} \text{ или } x = 0$$

$$x = 4,2 \text{ или } x = 0$$

**423.**

$$1) x(x - 15) = 3(108 - 5x); x^2 - 15x = 324 - 15x; x^2 = 324$$

$$x = 18 \text{ или } x = -18$$

$$2) (x - 7)(x + 3) + (x - 1)(x + 5) = 102$$

$$x^2 - 4x - 21 + x^2 + 4x - 5 = 102; 2x^2 = 128; x^2 = 64; x = 8 \text{ или } x = -8$$

$$3) (2x + 1)(x - 3) + (1 - x)(x - 5) = 29 - 11x$$

$$2x^2 - 5x - 3 - 6x + 5 + x^2 + 11x = 29; 3x^2 = 27; x^2 = 9 \quad x = 3 \text{ или } x = -3;$$

$$4) (3x - 8)^2 - (4x - 6)^2 + (5x - 2)(5x + 2) = 96$$

$$9x^2 - 48x + 64 - 16x^2 + 48x - 36 + 25x^2 - 4 = 96; 18x^2 = 72$$

$$x^2 = 4; x = 2 \text{ или } x = -2$$

**424.**

Если  $x$  – данное число, то:  $x^2 = 2x$ ;  $x^2 - 2x = 0$

$x(x - 2) = 0$ ; т.е.  $x = 0$  или  $x = 2$

Ответ: два решения 0; 2.

**425.**

Если  $y$  – данное число, то:  $y^2 - 4 = 0$ ;  $y^2 = 4$ ;  $y = 2$  или  $y = -2$

Ответ: два решения 2; -2.

**426.**

Дано:  $S = \pi R^2$ ;  $S = 2000 \text{ м}^2$

Найти:  $d$  – ?

$$2000 = \pi R^2, 2000 = \pi \cdot \left(\frac{d}{2}\right)^2; d^2 = \frac{8000}{\pi}, d = \sqrt{\frac{8000}{\pi}} \approx 50 \text{ м}$$

$$R^2 = \frac{2000}{\pi}, R = \sqrt{\frac{2000}{\pi}} \approx 25 \text{ м}; d = 2R \quad d \approx 50 \text{ м}$$

Ответ: 50 м.

**427.**

$$1) \quad \frac{x^2 - 9}{x - 3} = 0; \quad \left[ \begin{array}{l} x^2 - 9 = 0 \\ x - 3 \neq 0 \end{array} \right] \Rightarrow \left[ \begin{array}{l} (x - 3)(x + 3) = 0 \\ x \neq 3 \end{array} \right] \Rightarrow \left[ \begin{array}{l} x_1 = 3; x_2 = -3 \\ x \neq 3 \end{array} \right],$$

значит  $x = 3$  – не корень

Ответ: -3

$$2) \quad \frac{2x + x^2}{x + 2} = 0; \quad \left[ \begin{array}{l} 2x + x^2 = 0 \\ x + 2 \neq 0 \end{array} \right] \Rightarrow \left[ \begin{array}{l} x(2 + x) = 0 \\ x \neq -2 \end{array} \right] \Rightarrow \left[ \begin{array}{l} x_1 = 0; x_2 = -2 \\ x \neq -2 \end{array} \right],$$

значит  $x = -2$  – не корень

Ответ: 0.

**428.**

1) если  $m = 4$ , то  $x^2 + 4x + 4 = (x + 2)^2$

2) если  $m = 9$ , то  $x^2 - 6x + 9 = (x - 3)^2$

3) если  $m = 49$ , то  $x^2 - 14x + 49 = (x - 7)^2$

4) если  $m = 64$ , то  $x^2 - 16x + 64 = (x - 8)^2$

5) если  $m = \pm 4$ , то  $x^2 \pm 4x + 4 = (x \pm 2)^2$

6) если  $m = \pm 6$ , то  $x^2 \pm 6x + 9 = (x \pm 3)^2$

**429.**

1)  $x^2 - 4x - 5 = 0$

$x^2 - 4x + 4 - 4 - 5 = 0$ ;  $(x - 2)^2 = 3^2$

$x - 2 = 3$  или  $x - 2 = -3$

$x = 5$  или  $x = -1$

2)  $x^2 + 4x - 12 = 0$

$x^2 + 4x + 4 - 4 - 12 = 0$ ;  $(x + 2)^2 = 4^2$

$x + 2 = 4$  или  $x + 2 = -4$

$x = 2$  или  $x = -6$

$$3) x^2 + 2x - 15 = 0$$

$$x^2 + 2x + 1 - 1 - 15 = 0$$

$$(x + 1)^2 = 4^2$$

$$x + 1 = 4 \text{ или } x + 1 = -4$$

$$x = 3 \text{ или } x = -5$$

$$5) x^2 - 6x + 3 = 0$$

$$x^2 - 6x + 9 - 9 + 3 = 0$$

$$(x - 3)^2 - (\sqrt{6})^2 = 0$$

$$x - 3 = \sqrt{6} \text{ или } x - 3 = -\sqrt{6}$$

$$x = 3 + \sqrt{6} \text{ или } x = 3 - \sqrt{6}$$

$$4) x^2 - 10x + 16 = 0$$

$$x^2 - 10x + 25 - 25 + 16 = 0$$

$$(x - 5)^2 = 3^2$$

$$x - 5 = 3 \text{ или } x - 5 = -3$$

$$x = 8 \text{ или } x = 2$$

$$6) x^2 + 8x - 7 = 0$$

$$x^2 + 8x + 16 - 16 - 7 = 0$$

$$(x + 4)^2 - (\sqrt{23})^2 = 0$$

$$x + 4 = \sqrt{23} \text{ или } x + 4 = -\sqrt{23}$$

$$x = -4 + \sqrt{23} \text{ или } x = -4 - \sqrt{23}$$

**430.**

$$1) 9x^2 + 6x - 8 = 0$$

$$9x^2 + 6x + 1 - 1 - 8 = 0$$

$$(3x + 1)^2 = 3^2$$

$$3x + 1 = 3 \text{ или } 3x + 1 = -3$$

$$x = \frac{2}{3} \text{ или } x = -1\frac{1}{3}$$

$$2) 25x^2 - 10x - 3 = 0$$

$$25x^2 - 10x + 1 - 1 - 3 = 0$$

$$(5x - 1)^2 = 2^2$$

$$5x - 1 = 2 \text{ или } 5x - 1 = -2$$

$$x = \frac{3}{5} \text{ или } x = -\frac{1}{5}$$

**431.**

$$1) x^2 - 5x + 4 = 0$$

$$x^2 - 5x + 6,25 - 6,25 + 4 = 0$$

$$(x - 2,5)^2 = (1,5)^2$$

$$x - 2,5 = 1,5 \text{ или } x - 2,5 = -1,5$$

$$x = 4 \text{ или } x = 1$$

$$2) x^2 - 3x - 10 = 0$$

$$x^2 - 5x + 6,25 - 6,25 + 4 = 0$$

$$(x - 1,5)^2 = (3,5)^2$$

$$x - 1,5 = 3,5 \text{ или } x - 1,5 = -3,5$$

$$x = 5 \text{ или } x = -2$$

**432.**

$$1) 2x^2 + 3x - 5 = 0$$

$$4x^2 + 6x - 10 = 0$$

$$4x^2 + 6x + 2,25 - 2,25 - 10 = 0$$

$$(2x + 1,5)^2 = 3,5^2$$

$$2x + 1,5 = 3,5 \text{ или } 2x + 1,5 = -3,5$$

$$x_1 = 1; x_2 = -2,5$$

$$2) 5x^2 - 7x - 6 = 0,$$

$$25x^2 - 35x + 12,25 - 30 = 0$$

$$(5x - 3,5)^2 = (6,5)^2$$

$$5x - 3,5 = 6,5 \text{ или } 5x - 3,5 = -6,5$$

$$x = 2 \text{ или } x = -0,6$$

**433.**

$$\sqrt{D} = \sqrt{b^2 - 4ac}; a = 3; b = 1; c = -4, \sqrt{D} = \sqrt{1 + 48} = \sqrt{49} = 7$$

$$a = 3; b = -0,2; c = -0,01, \sqrt{D} = \sqrt{0,04 + 0,12} = \sqrt{0,16} = 0,4$$

$$a = 7; b = -6; c = -45, \sqrt{D} = \sqrt{36 + 1260} = \sqrt{1296} = 36$$

$$a = -1; b = 5; c = 1800, \sqrt{D} = \sqrt{25 + 7200} = \sqrt{7225} = 85$$

**434.**

$$1) 2x^2 + 3x + 1 = 0$$

$$D = b^2 - 4ac = 9 - 8 = 1$$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-3 \pm 1}{4}$$

$$x = -\frac{1}{2} \text{ или } x = -2$$

$$3) 2x^2 + 5x + 2 = 0$$

$$D = b^2 - 4ac = 25 - 16 = 9$$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-5 \pm 3}{4}$$

$$x = -\frac{1}{2} \text{ или } x = -2$$

$$5) 3x^2 + 11x + 6 = 0$$

$$D = b^2 - 4ac = 121 - 72 = 49$$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-11 \pm 7}{6}$$

$$x = -\frac{2}{3} \text{ или } x = -3$$

$$2) 2x^2 - 3x + 1 = 0$$

$$D = b^2 - 4ac = 9 - 8 = 1$$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{3 \pm 1}{4}$$

$$x = 2 \text{ или } x = \frac{1}{2}$$

$$4) 2x^2 - 7x + 3 = 0$$

$$D = b^2 - 4ac = 49 - 24 = 25,$$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{7 \pm 5}{4}$$

$$x = 3 \text{ или } x = \frac{1}{2}$$

$$6) 4x^2 - 11x + 6 = 0$$

$$D = b^2 - 4ac = 121 - 96 = 25$$

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{11 \pm 5}{8}$$

$$x = 2 \text{ или } x = \frac{3}{4}$$

**435.**

$$1) 2x^2 + 5x - 3 = 0$$

$$D = 25 + 24 = 49$$

$$x_{1,2} = \frac{-5 \pm 7}{4}$$

$$x_1 = \frac{1}{2}; x_2 = -3$$

$$3) x^2 + x - 3 = 0$$

$$D = 1 + 48 = 49$$

$$x = \frac{-1 \pm 7}{6}; x = 1 \text{ или } x = -\frac{4}{3}$$

$$5) x^2 + 4x - 3 = 0;$$

$$D = 16 + 4 \cdot 3 = 28$$

$$x_{1,2} = \frac{-4 \pm \sqrt{28}}{2} = -2 \pm 7$$

$$7) -2x^2 + x + 1 = 0; 2x^2 - x - 1 = 0$$

$$D = b^2 - 4ac = 1 + 8 = 9$$

$$x_1 = \frac{1+3}{4} = 1; x_2 = \frac{1-3}{4} = -0,5$$

$$2) 2x^2 - 7x - 4 = 0$$

$$D = 49 + 32 = 81$$

$$x_{1,2} = \frac{7 \pm 9}{4}$$

$$x_1 = 4; x_2 = -\frac{1}{2}$$

$$4) 3x^2 + 2x - 1 = 0$$

$$D = 4 + 12 = 16$$

$$x = \frac{-2 \pm 4}{6}; x = \frac{1}{3} \text{ или } x = -1$$

$$6) 3x^2 + 12x + 10 = 0;$$

$$D = 144 - 12 \cdot 10 = 24$$

$$x_{1,2} = \frac{-12 \pm \sqrt{24}}{6} = \frac{-6 \pm \sqrt{6}}{3}$$

$$8) -3x^2 - x + 4 = 0; 3x^2 + x - 4 = 0$$

$$D = b^2 - 4ac = 1 + 48 = 49$$

$$x_1 = \frac{-1+7}{6} = 1; x_2 = \frac{-8}{6} = -\frac{4}{3}$$

**436.**

1)  $9x^2 - 6x + 1 = 0;$

$D = 36 - 36 = 0$

$x = \frac{6}{18} = \frac{1}{3}$

3)  $49x^2 + 28x + 4 = 0; D = 0$

$x = \frac{-28}{2 \cdot 49} = -\frac{2}{7}$

2)  $16x^2 - 8x + 1 = 0;$

$D = 64 - 64 = 0$

$x = \frac{8}{32} = 0,25$

4)  $36x^2 + 12x + 1 = 0; D = 0$

$x = \frac{-12}{72} = -\frac{1}{6}$

**437.**

1)  $2x^2 + x + 1 = 0$

$D = 1 - 8 = -7 < 0$ , нет решений

3)  $5x^2 + 2x + 3 = 0$

$D = 4 - 60 = -56 < 0$ , нет решений

2)  $3x^2 - x + 2 = 0$

$D = 1 - 24 = -23 < 0$ , нет решений

4)  $x^2 - 2x + 10 = 0$

$D = 4 - 40 = -36 < 0$ , нет решений

**438.**

1)  $2x^2 + 5x - 7 = 0$

$D = 25 + 56 = 81 > 0$ , 2 корня

3)  $4x^2 + 4x + 1 = 0$

$D = 16 - 16 = 0$ , 1 корень

2)  $3x^2 - 7x - 8 = 0$

$D = 49 + 96 = 145 > 0$ , 2 корня

4)  $9x^2 - 6x + 2 = 0$

$D = 36 - 72 = -36 < 0$ , корней нет

**439.**

1)  $7x^2 - 6x + 2 = 0$

$D = 36 - 56 < 0$

нет решений

3)  $9x^2 + 12x + 4 = 0$

$(3x + 2)^2 = 0$ ; т.е.  $x = -\frac{2}{3}$

5)  $4x^2 + 12x + 9 = 0$

$(2x + 3)^2 = 0$

$x = -1,5$

2)  $3x^2 - 5x + 4 = 0$

$D = b^2 - 4ac = 25 - 48 = -23 < 0$ ,

нет решений

4)  $4x^2 - 20x + 25 = 0$

$(2x - 5)^2 = 0$ , т.е.  $x = 2,5$

6)  $x^2 - 3x - 4 = 0; D = 9 + 16 = 25$

$x = \frac{3 \pm 5}{2}$ , т.е.  $x = 4$  или  $x = -1$

**440.**

1)  $6x^2 = 5x + 1; 6x^2 - 5x - 1 = 0$

$D = 25 + 4 \cdot 6 = 49$

$x = \frac{5 \pm 7}{12}$ ;  $x = 1$  или  $x = -\frac{1}{6}$

3)  $x(x - 1) = 72$

$x^2 - x - 72 = 0$

$D = 1 + 288 = 289$

$x = \frac{1 \pm 17}{2}$ ;  $x = 9$  или  $x = -8$

2)  $5x^2 + 1 = 6x; 5x^2 - 6x + 1 = 0$

$D = 36 - 4 \cdot 5 = 16$

$x = \frac{6 \pm 4}{10}$ ;  $x = 1$  или  $x = \frac{1}{5}$

4)  $x(x + 1) = 56$

$x^2 + x - 56 = 0$

$D = 1 + 224 = 225$

$x = \frac{-1 \pm 15}{2}$ ;  $x = 7$  или  $x = -8$



$$5) 2x(x+2) = 8x+3$$

$$2x^2+4x-8x-3=0$$

$$2x^2-4x-3=0$$

$$D=16+4 \cdot 2 \cdot 3=40$$

$$x_{1,2} = \frac{-4 \pm \sqrt{40}}{4} = \frac{-2 \pm \sqrt{10}}{2}$$

$$6) 3x(x-2) - 1 = x - \frac{1}{2}(8+x^2)$$

$$3x^2 - 6x - 1 - x + 4 + \frac{1}{2}x^2 = 0$$

$$3,5x^2 - 7x + 3 = 0; 7x^2 - 14x + 6 = 0$$

$$D=196-24 \cdot 7=28$$

$$x_{1,2} = \frac{14 \pm \sqrt{28}}{7}$$

**441.**

$$1) \frac{x^2+3x}{2} = \frac{x+7}{4}$$

$$2x^2+6x=x+7; 2x^2+5x-7=0$$

$$D=25+56=81$$

$$x_{1,2} = \frac{-5 \pm 9}{4}; x_1=1; x_2=-3,5$$

$$3) \frac{2x^2+x}{3} - \frac{2-3x}{4} = \frac{x^2-6}{6}$$

$$8x^2+4x-6+9x=2x^2-12$$

$$6x^2+13x+6=0$$

$$D=169-144=25$$

$$x = \frac{-13 \pm 5}{12}$$

$$x = -1,5 \text{ или } x = -\frac{2}{3}$$

$$2) \frac{x^2-3x}{7} + x = 11$$

$$x^2-3x+7x-77=0; x^2+4x-77=0$$

$$\frac{D}{4} = 4+77=81; x_{1,2} = -2 \pm 9$$

$$x_1 = -11; x_2 = 7$$

$$4) \frac{x^2+x}{4} - \frac{3-7x}{20} = 0,3$$

$$5x^2+5x-3+7x=6$$

$$5x^2+12x-9=0$$

$$\frac{D}{4} = \left(\frac{b}{2}\right)^2 - ac = 36+45=81$$

$$x = \frac{-\frac{b}{2} \pm \sqrt{\frac{D}{4}}}{a} = \frac{-6 \pm 9}{5}$$

$$x = \frac{3}{5} \text{ или } x = -3$$

**442.**

$$ax^2+3x+2=0; D=9-8a$$

$$1) D > 0; 9-8a > 0 \quad 2) D < 0; 9-8a < 0 \quad 3) D = 0; 9-8a = 0$$

$$a < 1\frac{1}{8}$$

$$a > 1\frac{1}{8}$$

$$a = 1\frac{1}{8}$$

**443.**

$$x^2-2x+q=0; \frac{D}{4}=1-q.$$

$$1) \frac{D}{4} > 0; 1-q > 0; q < 1$$

$$2) \frac{D}{4} = 0; 1-q = 0; q = 1$$

**444.**

1)  $5x^2 - 8x - 4 = 0$

$$\frac{D}{4} = 16 + 20 = 36$$

$$x = \frac{4 \pm 6}{5}; \text{ т.е. } x = 2 \text{ или } x = -\frac{2}{5}$$

2)  $4x^2 + 4x - 3 = 0$

$$\frac{D}{4} = 4 + 12 = 16$$

$$x = \frac{-2 \pm 4}{4}; \text{ т.е. } x = \frac{1}{2} \text{ или } x = -\frac{3}{2}$$

3)  $8x^2 - 6x + 1 = 0; \frac{D}{4} = 9 - 8 = 1$

4)  $5x^2 - 26x + 5 = 0; \frac{D}{4} = 169 - 25 = 144$

$$x = \frac{3 \pm 1}{8}; \text{ т.е. } x = \frac{1}{2} \text{ или } x = \frac{1}{4}$$

$$x = \frac{13 \pm 12}{5}; \text{ т.е. } x = 5 \text{ или } x = \frac{1}{5}$$

**445.**

$$x^2 + 2mx + c = 0; \frac{D}{4} = m^2 - c; x_{1,2} = -m \pm \sqrt{\frac{D}{4}}$$

1)  $x^2 - 12x + 20 = 0, m = -6, c = 20$

2)  $x^2 + 10x + 24 = 0, m = 5, c = 24$

$$\frac{D}{4} = 36 - 20 = 16$$

$$\frac{D}{4} = 25 - 24 = 1$$

$$x_{1,2} = 6 \pm 4; \text{ т.е. } x_1 = 2; x_2 = 10$$

$$x = -5 \pm 1; \text{ т.е. } x = -4 \text{ или } x = -6$$

3)  $x^2 + 10x - 24 = 0, m = 5, c = -24$

4)  $x^2 - 50x + 49 = 0, m = -25, c = 49$

$$\frac{D}{4} = 25 + 24 = 49$$

$$\frac{D}{4} = 625 - 49 = 576$$

$$x = -5 \pm 7; \text{ т.е. } x = 2 \text{ или } x = -12$$

$$x = 25 \pm 24; \text{ т.е. } x = 49 \text{ или } x = 1$$

**448.**

$x^2 + px - 1 = 0; D = p^2 + 4 > 0$  для любого  $p$ , поэтому уравнение имеет 2 различных корня при любых  $p$ .

**449.**

$ax^2 + bx - a = 0, a \neq 0, b$  – любое;  $D = b^2 + 4a^2 > 0$  для любого  $b$ .

**450.**

1)  $x^2 + 4x - 5 = 0$

2)  $x^2 - 6x - 7 = 0$

3)  $x^2 - 8x - 9 = 0$

$$D = 4 + 5 = 9$$

$$D = 36 + 4 \cdot 7 = 64$$

$$D = 64 + 4 \cdot 9 = 100$$

$$x = -2 \pm 3$$

$$x_1 = \frac{6+8}{2} = 7;$$

$$x_1 = \frac{8+10}{2} = 9;$$

$$x_1 = 1; x_2 = -5$$

$$x_2 = -1$$

$$x_2 = -1$$

4)  $x^2 + 6x - 40 = 0$

5)  $x^2 + x - 6 = 0$

6)  $x^2 - x - 2 = 0$

$$D = 36 + 4 \cdot 40 = 196$$

$$D = 1 + 4 \cdot 6 = 25$$

$$D = 1 + 4 \cdot 2 = 9$$

$$x_1 = \frac{-6+14}{2} = 4$$

$$x_1 = \frac{-1 \pm 5}{2} = 2$$

$$x_1 = \frac{1 \pm 3}{2} = 2$$

$$x_2 = -10$$

$$x_2 = -3$$

$$x_2 = -1$$

**451.**

1) $x^2 - x - 2 = 0$	2) $x^2 - 5x - 6 = 0$	3) $x^2 + 3x + 2 = 0$
$\begin{cases} x_1 + x_2 = 1 \\ x_1 \cdot x_2 = -2 \end{cases}$	$\begin{cases} x_1 + x_2 = 5 \\ x_1 \cdot x_2 = -6 \end{cases}$	$\begin{cases} x_1 + x_2 = -3 \\ x_1 \cdot x_2 = 2 \end{cases}$
4) $x^2 + 3x - 4 = 0$	5) $x^2 - 7x + 5 = 0$	6) $x^2 + 9x - 6 = 0$
$\begin{cases} x_1 + x_2 = -3 \\ x_1 \cdot x_2 = -4 \end{cases}$	$\begin{cases} x_1 + x_2 = 7 \\ x_1 \cdot x_2 = 5 \end{cases}$	$\begin{cases} x_1 + x_2 = -9 \\ x_1 \cdot x_2 = -6 \end{cases}$

**452.**

$$x^2 - 19x + 18 = 0, \text{ если } x_1 = 1, \text{ то } x_2 = 18.$$

**453.**

$$28x^2 + 23x - 5 = 0, x^2 + \frac{23}{28}x - \frac{5}{28} = 0, \text{ если } x_1 = -1, \text{ то } x_2 = \frac{5}{28},$$

$$\text{т.к. } x_1 \cdot x_2 = -\frac{5}{28}.$$

**454.**

1) $x^2 + 4x - 5 = 0; x_1 > 0, x_2 < 0$	2) $x^2 + 5x + 35 = 0; x_1 < 0, x_2 < 0$
3) $x^2 - 5x + 3 = 0; x_1 > 0, x_2 > 0$	4) $x^2 - 8x - 7 = 0; x_1 < 0, x_2 > 0$

**455.**

1) $x_1 = 3; x_2 = -1, x^2 - 2x - 3 = 0$	2) $x_1 = 2; x_2 = 3, x^2 - 5x + 6 = 0$
3) $x_1 = -4; x_2 = -5, x^2 + 9x + 20 = 0$	4) $x_1 = -3; x_2 = 6, x^2 - 3x - 18 = 0$

**456.**

1) $x^2 + 5x + 6 = 0$	2) $x^2 - 7x + 12 = 0$	3) $x^2 - 6x + 5 = 0$
$\begin{cases} x_1 + x_2 = -5 \\ x_1 \cdot x_2 = 6 \end{cases}$	$\begin{cases} x_1 + x_2 = 7 \\ x_1 \cdot x_2 = 12 \end{cases}$	$\begin{cases} x_1 + x_2 = 6 \\ x_1 \cdot x_2 = 5 \end{cases}$
$x_1 = -3$	$x_1 = 3$	$x_1 = 5$
$x_2 = -2$	$x_2 = 4$	$x_2 = 1$
4) $x^2 + 8x + 7 = 0$	5) $x^2 - 8x + 15 = 0$	6) $x^2 + 2x - 15 = 0$
$\begin{cases} x_1 + x_2 = -8 \\ x_1 \cdot x_2 = 7 \end{cases}$	$\begin{cases} x_1 + x_2 = 8 \\ x_1 \cdot x_2 = 15 \end{cases}$	$\begin{cases} x_1 + x_2 = -2 \\ x_1 \cdot x_2 = -15 \end{cases}$
$x_1 = -7$	$x_1 = 5$	$x_1 = -5$
$x_2 = -1$	$x_2 = 3$	$x_2 = 3$

**457.**

1) $x^2 - 5x + 6 = 0$	$x_1 = 3, x_2 = 2, \text{ ПОЭТОМУ}$
$x^2 - 5x + 6 = (x - 3)(x - 2)$	
2) $x^2 + 4x - 6 = 0$	$x_1 = 1, x_2 = -5, \text{ ПОЭТОМУ}$
$x^2 + 4x - 6 = (x - 1)(x + 5)$	

$$3) x^2 + 5x - 24 = 0; x_1 = 3, x_2 = -8, \text{ поэтому } x^2 + 5x - 24 = (x - 3)(x + 8);$$

$$4) x^2 + x - 42 = 0; x_1 = 6, x_2 = -7, \text{ поэтому } x^2 + x - 42 = (x - 6)(x + 8);$$

$$5) 2x^2 - x - 1 = 0; x_1 = 1, x_2 = -\frac{1}{2}, \text{ поэтому } 2x^2 - x - 1 =$$

$$= 2(x - 1)\left(x + \frac{1}{2}\right) = (x - 1)(2x + 1);$$

$$6) 8x^2 + 10x + 3 = 0; x_1 = -\frac{3}{4}, x_2 = -\frac{1}{2}, \text{ поэтому}$$

$$8x^2 + 10x + 3 = 8\left(x + \frac{3}{4}\right)\left(x + \frac{1}{2}\right) = (4x + 3)(2x + 1);$$

$$7) -6x^2 + 7x - 2 = 0; x_1 = \frac{1}{2}, x_2 = \frac{2}{3}, \text{ поэтому}$$

$$-6x^2 + 7x - 2 = -6\left(x - \frac{1}{2}\right)\left(x - \frac{2}{3}\right) = (1 - 2x)(3x - 2);$$

$$8) -4x^2 - 7x + 2 = 0, \text{ т.к. } x_1 = -2, x_2 = \frac{1}{4};$$

$$-4x^2 - 7x + 2 = -4\left(x + 2\right)\left(x - \frac{1}{2}\right) = (x + 2)(1 - 4x).$$

**458.**

$$1) \frac{x^2 + x - 2}{x - 1} = \frac{(x + 2)(x - 1)}{x - 1} = x + 2$$

$$2) \frac{x^2 + 4x - 12}{x - 2} = \frac{(x - 2)(x + 6)}{x - 2} = x + 6$$

$$3) \frac{x + 3}{x^2 - 6x - 27} = \frac{x + 3}{(x - 9)(x + 3)} = \frac{1}{x - 9}$$

$$4) \frac{x - 8}{x^2 - x - 56} = \frac{x - 8}{(x + 7)(x - 8)} = \frac{1}{x + 7}$$

$$5) \frac{2x^2 - 3x - 2}{4x^2 - 1} = \frac{2(x - 2)\left(x + \frac{1}{2}\right)}{(2x - 1)(2x + 1)} = \frac{(2x + 1)(x - 2)}{(2x - 1)(2x + 1)} = \frac{x - 2}{2x - 1}$$

$$6) \frac{3x^2 + 8x - 3}{9x^2 - 1} = \frac{3\left(x - \frac{1}{3}\right)(x + 3)}{(3x - 1)(3x + 1)} = \frac{(x + 3)(3x - 1)}{(3x - 1)(3x + 1)} = \frac{x + 3}{3x + 1}$$

**459.**

$$1) x^2 - 2\sqrt{3x} - 1 = 0$$

$$\frac{D}{4} = 3 + 1 = 4$$

$$x_{1,2} = \sqrt{3} \pm 2$$

$$3) x^2 + \sqrt{2x} - 4 = 0$$

$$\frac{D}{4} = 2 + 16 = 18$$

$$x_{1,2} = \frac{-\sqrt{2} \pm 3\sqrt{2}}{2}$$

$$x_1 = \sqrt{2}, x_2 = -2\sqrt{2}$$

$$2) x^2 - 2\sqrt{5x} + 1 = 0$$

$$\frac{D}{4} = 5 - 1 = 4$$

$$x_{1,2} = \sqrt{5} \pm 2$$

$$4) x^2 - 4\sqrt{7x} + 4 = 0$$

$$\frac{D}{4} = 28 - 4 = 24$$

$$x_{1,2} = 2\sqrt{7} \pm 2\sqrt{6} = 2(\sqrt{7} \pm \sqrt{6})$$

**460.**

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

$$2) x^3 + 4x^2 - 21x = x(x^2 + 4x + 21) = x(x - 3)(x + 7)$$

$$3) x^3 + 5x^2 - 24x = x(x^2 + 5x - 24) = x(x - 3)(x + 8)$$

$$4) x^3 - 9x^2 - 22x = x(x^2 - 9x + 22) = x(x - 11)(x + 2)$$

**461.**

$$1) \frac{x^2 + 6x - 7}{x^2 - 7x + 6} = \frac{(x-1)(x+7)}{(x-1)(x-6)} = \frac{x+7}{x-6}$$

$$2) \frac{x^2 - 8x - 9}{x^2 + 9x + 8} = \frac{(x+1)(x-9)}{(x+8)(x+1)} = \frac{x-9}{x+8}$$

$$3) \frac{x^2 - 8x + 15}{-x^2 + 5x - 6} = \frac{(x-3)(x-5)}{(x-3)(2-x)} = \frac{x-5}{2-x}$$

$$4) \frac{36 + 5x - x^2}{x^2 - x - 20} = \frac{-(x-9)(x+4)}{(5-x)(x+4)} = \frac{x-9}{5-x}$$

**462.**

$$\begin{aligned} 1) \frac{1}{x^2 - 7x + 12} + \frac{1}{x - 3} &= \frac{1}{(x-4)(x-3)} + \frac{1}{x-3} = \frac{1+x-4}{(x-4)(x-3)} = \\ &= \frac{x-3}{(x-4)(x-3)} = \frac{1}{x-4} \end{aligned}$$

$$2) \frac{3}{x^2 + 6x + 9} - \frac{1}{x+3} = \frac{3}{(x+3)^2} - \frac{1}{(x+3)} = \frac{3-x-3}{(x+3)^2} = -\frac{x}{(x+3)^2}$$

$$3) \frac{7}{5x^2+3x-2} - \frac{5}{5x-2} = \frac{7}{(5x-2)(x+1)} - \frac{5}{5x-2} = \frac{7-5(x+1)}{(5x-2)(x+1)} =$$

$$= \frac{7-5x-5}{(5x-2)(x+1)} = -\frac{1}{x+1}$$

$$4) \frac{5x+1}{x^2+9x-10} : \frac{5x^2+x}{x^2-2x+1} = \frac{(5x+1)(x-1)^2}{(x-1)(x+10) \cdot x(5x+1)} = \frac{x-1}{x(x+10)}$$

**463.**

$x^2 + px + q = 0$ ;  $x_1$ ;  $x_2$  – корни уравнения

$$\left\{ \begin{array}{l} -x_1 + (-x_2) = -(x_1 + x_2) = p \\ (-x_1) \cdot (-x_2) = x_1 \cdot x_2 = q \end{array} \right\} \rightarrow x^2 - px + q = 0$$

**464.**

$x^2 + 6x + q = 0$ ;  $x_1$ ;  $x_2$  – корни уравнения. Найти  $q$ ;  $x_1$ ;  $x_2$

По теореме Виста:  $\left\{ \begin{array}{l} x_1 + x_2 = 6 \\ x_1 \cdot x_2 = q \\ x_2 = 2x_1 \end{array} \right\} \left\{ \begin{array}{l} x_1 + 2x_1 = -6 \\ x_1 \cdot x_2 = q \\ x_2 = 2x_1 \end{array} \right\}$  Получаем:

$$x_1 = -2$$

$$x_2 = 2 \cdot (-2) = -4$$

$$q = -2 \cdot (-4) = 8$$

Ответ:  $x_1 = -2$ ;  $x_2 = -4$ ;  $q = 8$

**465.**

$x^2 + px + 3 = 0$ ;  $x_1$ ;  $x_2$  – корни уравнения. По теореме Виста:

$$\left\{ \begin{array}{l} x_1 + x_2 = -p \\ x_1 \cdot x_2 = 3 \\ x_2 = 3x_1 \end{array} \right\} \left\{ \begin{array}{l} 3x_1^2 = 3 \\ x_1 \cdot x_2 = 3 \\ x_1 + x_2 = -p \end{array} \right\} \left\{ \begin{array}{l} x_1 = 1 \quad \text{или} \quad x_1 = -1 \\ x_2 = 3 \quad \text{или} \quad x_2 = -3 \\ x_1 + x_2 = 4 \quad \text{или} \quad x_1 + x_2 = -4 \end{array} \right.$$

Ответ:  $x_1 = 1$ ;  $x_2 = 3$ ;  $p = -4$ ; или  $x_1 = -1$ ;  $x_2 = -3$ ;  $p = -4$

**466.**

$3x^2 - 8x - 15 = 0$ ;  $x_1$ ;  $x_2$  – корни уравнения

$$3x^2 - 8x - 15 = 0; x^2 - \frac{8}{3}x - 5 = 0; \left\{ \begin{array}{l} x_1 + x_2 = \frac{8}{3} \\ x_1 \cdot x_2 = -5 \end{array} \right.$$

$$1) \frac{1}{x_1} + \frac{1}{x_2} = \frac{x_1 + x_2}{x_1 \cdot x_2} = \frac{8}{3} : (-5) = -\frac{8}{15}$$

$$\begin{aligned}
& 2) x_1^2 + x_2^2 = x_1^2 + 2x_1x_2 + x_2^2 - 2x_1x_2 = (x_1 + x_2)^2 - 2x_1x_2 = \\
& = \left(\frac{8}{3}\right)^2 - 2 \cdot (-5) = 17\frac{1}{9}; \quad 3) \frac{x_1}{x_2} + \frac{x_2}{x_1} = \frac{x_1^2 + x_2^2}{x_1 \cdot x_2} = 17\frac{1}{9} : (-5) = \frac{154}{-45} = -3\frac{19}{45} \\
& 4) x_1^3 + x_2^3 = (x_1 + x_2)(x_1^2 - x_1x_2 + x_2^2) = \\
& = \frac{8}{3} \left(17\frac{1}{9} + 5\right) = \frac{8}{3} \cdot 22\frac{1}{9} = 58\frac{26}{27}
\end{aligned}$$

**468.**

$$\begin{aligned}
1) x^4 - 10x^2 + 9 = 0; x^2 = t \\
t^2 - 10t + 9 = 0; t_1 = 9; t_2 = 1 \\
x^2 = 9 \text{ или } x^2 = 1; x_{1,2} = \pm 3, x_{3,4} = \pm 1
\end{aligned}$$

Ответ:  $\pm 3; \pm 1$

$$\begin{aligned}
3) x^4 - 13x^2 + 36 = 0; x^2 = t \\
t^2 - 13t + 36 = 0; t_1 = 9; t_2 = 4 \\
x^2 = 9 \text{ или } x^2 = 4
\end{aligned}$$

$$x_{1,2} = \pm 3; x_{3,4} = \pm 2$$

Ответ:  $\pm 3; \pm 2$

$$2) x^4 - 5x^2 + 4 = 0; x^2 = t$$

$$t^2 - 5t + 4 = 0; t_1 = 4; t_2 = 1$$

$$x^2 = 4 \text{ или } x^2 = 1; x_{1,2} = \pm 2; x_{3,4} = \pm 1$$

Ответ:  $\pm 2; \pm 1$

$$\begin{aligned}
4) x^4 - 50x^2 + 49 = 0; x^2 = t \\
t^2 - 50t + 49 = 0; t_1 = 49; t_2 = 1 \\
x^2 = 49 \text{ или } x^2 = 1
\end{aligned}$$

$$x_{1,2} = \pm 7; x_{3,4} = \pm 1$$

Ответ:  $\pm 7; \pm 1$

**469.**

$$\begin{aligned}
1) x^4 - 3x^2 - 4 = 0, x^2 = t \\
t^2 - 3t - 4 = 0; t_1 = 4, t_2 = -1 \\
x^2 = 4; x_{1,2} = \pm 2;
\end{aligned}$$

$$x^2 = -1 - \text{нет корней}$$

Ответ:  $\pm 2$

$$\begin{aligned}
3) x^4 + x^2 - 20 = 0, x^2 = t \\
t^2 + t - 20 = 0; t_1 = -5, t_2 = 4 \\
x^2 = -5 - \text{нет корней}
\end{aligned}$$

$$x^2 = 4; x_{1,2} = \pm 2$$

Ответ:  $\pm 2$

$$2) x^4 + 3x^2 - 4 = 0, x^2 = t$$

$$t^2 + 3t - 4 = 0; t_1 = -4, t_2 = 1$$

$$x^2 = -4 - \text{нет корней}$$

$$x^2 = 1; x_{1,2} = \pm 1$$

Ответ:  $\pm 1$

$$4) x^4 - 4x^2 - 5 = 0, x^2 = t$$

$$t^2 - 4t - 5 = 0; t_1 = 5, t_2 = -1$$

$$x^2 = 5; x_{1,2} = \pm \sqrt{5}$$

$$x^2 = -1 - \text{нет корней}$$

Ответ:  $\pm \sqrt{5}$

**470.**

$$1) \frac{10}{x-3} - \frac{8}{x} = 1; \frac{10x - 8(x-3) - x(x-3)}{x(x-3)} = 0;$$

$$\frac{10x - 8x + 24 - x^2 + 3x}{x(x-3)} = 0; \frac{x^2 - 5x - 24}{x(x-3)} = 0, x^2 + 5x + 24 = 0$$

$$\begin{cases} x^2 - 5x - 24 = 0 \\ x(x-3) \neq 0 \end{cases}; \begin{cases} x = 8 \text{ или } x = -3 \\ x \neq 0; x \neq 3 \end{cases}.$$

Ответ:  $x = 8; x = -3$ .

$$2) \frac{2}{x-5} + \frac{14}{x} = 3; \frac{2x+14(x-5)}{x(x-5)} - 3 = 0;$$

$$\frac{2x+14x-70-3(x^2-5x)}{x(x-5)} = 0; \frac{-3x^2+31x-70}{x(x-5)} = 0;$$

$$3x^2 - 31x + 70 = 0; x_1 = 7; x_2 = 3\frac{1}{3}; \text{Ответ: } 7; 3\frac{1}{3}$$

$$3) \frac{1}{x} + \frac{1}{x+3} = \frac{3}{20}; \frac{x+3+x}{x(x+3)} - \frac{3}{20} = 0$$

$$20(2x+3) = 3x(x+3); 40x+60 = 3x^2+9x$$

$$3x^2 - 31x - 60 = 0; x_1 = 12; x_2 = -1\frac{2}{3}$$

$$\text{Ответ: } 12; -1\frac{2}{3}.$$

$$4) \frac{40}{x-20} - \frac{40}{x} = 1; \frac{40x-40x+800}{x(x-20)} - 1 = 0$$

$$800 = x^2 - 20x; x^2 - 20x - 800 = 0; x_2 = 40; x_1 = -20. \text{ Ответ: } -20; 40.$$

$$5) \frac{1}{x-3} + \frac{1}{x+3} = \frac{5}{8}; \frac{x+3+x-3}{(x+3)(x-3)} - \frac{5}{8} = 0$$

$$16x = 5(x^2 - 9); 5x^2 - 16x - 45 = 0; x_1 = 5; x_2 = -1,8. \text{ Ответ: } -1,8; 5$$

$$6) \frac{4}{x-2} + \frac{4}{x+2} = 1,5; \frac{4x+8+4x-8}{(x+2)(x-2)} - \frac{3}{2} = 0$$

$$16x = 3(x^2 - 4); 3x^2 - 16x - 12 = 0; x_1 = 6; x_2 = -\frac{2}{3}. \text{ Ответ: } -\frac{2}{3}; 6$$

**471.**

$$1) \frac{3x+4}{x-6} = \frac{x-2}{4x+3}; \frac{3x+4}{x-6} - \frac{x-2}{4x+3} = 0$$

$$(3x+4)(4x+3) - (x-6)(x-2) = 0; 12x^2 + 9x + 16x + 12 = x^2 - 8x + 12; 11x^2 + 33 = 0; x(x+3) = 0; x_1 = -3; x_2 = 0$$

$$\text{Ответ: } -3; 0.$$

$$2) \frac{x+2}{x-2} + \frac{x-2}{x+2} = \frac{13}{6}$$

$$\frac{x^2+4x+4+x^2-4x+4}{x^2-4} = \frac{13}{6}; 6(2x^2+8) - 13(x^2-4) = 0$$

$$12x^2 + 48 - 13x^2 + 52 = 0; x^2 - 100 = 0, \text{ т.е. } x_1 = -10; x_2 = 10$$

$$\text{Ответ: } -10; 10.$$



$$3) \frac{x+5}{x+2} + \frac{1}{(x+1)(x+2)} = \frac{1}{x+1}; \frac{(x+5)(x+1)+1-(x+2)}{(x+1)(x+2)} = 0;$$

$x^2 + 6x + 5 + 1 - x - 2 = 0; x^2 + 5x + 4 = 0; x_1 = -4; x_2 = -1$  – посторонний корень, т.к. знаменатель равен 0.

Ответ: -4.

$$4) \frac{x^2 - 2x - 5}{(x-3)(x-1)} + \frac{1}{x-3} = 1; \frac{x^2 - 2x - 5 + x - 1 - (x-3)(x-1)}{(x-3)(x-1)} = 0;$$

$$x^2 - x - 6 - x^2 + 4x - 3 = 0;$$

$3x - 9 = 0; x = 3$  – посторонний корень, т.к. знаменатель равен 0.

Ответ: нет корней.

$$5) \frac{x^2}{x+3} - \frac{x}{-3-x} = \frac{6}{x+3}; \frac{x^2+x}{x+3} = \frac{6}{x+3}; x^2+x-6=0;$$

$x_1 = -3$ , – посторонний корень, т.к. знаменатель равен 0;  $x_2 = 2$ .

Ответ: 2.

$$6) \frac{x^2}{x-1} - \frac{2x}{1-x} = \frac{3}{x-1}; \frac{x^2}{x-1} + \frac{2x}{x-1} = \frac{3}{x-1}; x^2 + 2x - 3 = 0;$$

$x_1 = -3; x_2 = 1$  – посторонний корень, т.к. знаменатель равен 0.

Ответ: -3.

**472.**

$$1) x^4 - 5x^2 + 7 = 0, x^2 = t$$

$$D = 25 - 28 = -3 < 0,$$

действительных корней нет

$$2) x^4 + 3x^2 + 2 = 0, x^2 = t$$

$$D = 9 - 8 > 0, \text{ корни есть}$$

$$t = -1 \text{ или } t = -2$$

действительных корней нет.

**473.**

$$1) \frac{6}{x^2-1} + \frac{1}{1-x} = 2 - \frac{x+4}{x+1}; \frac{6-(x+1)}{(x-1)(x+1)} - \frac{2(x+1)-x-4}{x+1} = 0$$

$$\frac{5-x}{(x-1)(x+1)} - \frac{x-2}{x+1} = 0; 5-x-(x-2)(x-1) = 0;$$

$x^2 - 2x - 3 = 0; x_1 = 3; x_2 = -1$  – посторонний корень, т.к. знаменатель равен 0.

Ответ: 3.

$$2) \frac{1}{x+2} - \frac{3}{x-2} = \frac{4}{4-x^2} + 1; \frac{x-2-3x-6}{x^2-4} - \frac{4+4-x^2}{4-x^2} = 0$$

$$8+2x-8+x^2=0; x^2+2x=0; x(x+2)=0$$

$x_1 = 0; x_2 = -2$  – посторонний корень, т.к. знаменатель равен 0.

Ответ: 0.

**474.**

$$1) (x-1)^4 - 5(x-1)^2 + 4 = 0; (x-1)^2 = t; t^2 - 5t + 4 = 0$$

$$t_1 = 4; t_2 = 1; (x-1)^2 = 4 \text{ или } (x-1)^2 = 1$$

$$\begin{cases} x-1=2 \\ x-1=-2 \end{cases} \quad \begin{cases} x_1=3 \\ x_2=-1 \end{cases}; \quad \begin{cases} x-1=1 \\ x-1=-1 \end{cases} \quad \begin{cases} x_3=2 \\ x_4=0 \end{cases}$$

Ответ:  $-1; 0; 2; 3$ .

$$2) (x+5)^4 + 8(x+5)^2 - 9 = 0; (x+5)^2 = t; t^2 + 8t - 9 = 0$$

$$t_1 = -9; t_2 = 1; (x+5)^2 = -9 - \text{нет корней или } (x+5)^2 = 1$$

$$\begin{cases} x+5=1 \\ x+5=-1 \end{cases} \quad \begin{cases} x_1=-4 \\ x_2=-6 \end{cases}$$

Ответ:  $-6; -4$ .

**475.**

Калькулятор.

**476.**

Пусть  $a$  – I число, тогда  $a+1$  – II число

$$1) a(a+1) = 156; a^2 + a - 156 = 0 \quad 2) a(a+1) = 210; a^2 + a - 210 = 0$$

$$a_1 = -13 - \text{не удовлетворяет ус-} \quad D = 1 + 840 = 841$$

ловию;

$$a_1 = 14; a_2 = -15 - \text{не удовле-}$$

$$a_2 = 12. \text{ Имеем: } 12 - \text{I число;}$$

творяет условию;

$$13 - \text{II число}$$

$$14 - \text{I число, } 15 - \text{II число}$$

**477.**

Пусть  $n$  – I нечетное число,  $n+2$  – II нечетное число, тогда

$$1) n(n+2) = 255$$

$$2) n(n+2) = 399$$

$$n^2 + 2n - 255 = 0; n_{1,2} = -1 \pm 16$$

$$n^2 + 2n - 399 = 0; n_{1,2} = -1 \pm 20$$

$$n_1 = 15; n_2 = -17$$

$$n_1 = 19; n_2 = -21$$

$$15 - \text{I число, } 17 - \text{II число}$$

$$19 - \text{I число, } 21 - \text{II число}$$

**478.**

Пусть  $a, b$  (м) – стороны прямоугольника,  $4 \text{ дм}^2 = 0,04 \text{ м}^2$

$$P = 2(a+b), S = ab$$

$$\begin{cases} 2(a+b)=1 \\ ab=0,04 \end{cases}, \quad \begin{cases} 2a+2b=1 \\ a=\frac{0,04}{b} \end{cases}, \quad \frac{2 \cdot 0,04}{b} + 2b = 1; \quad 0,08 + 2b^2 - b = 0$$

$$2b^2 - b + 0,08 = 0$$

$$b = \frac{1 \pm 0,6}{4}; \text{ т.е. } b = 0,4 \text{ или } b = 0,1$$

$$a = 0,1 \text{ или } a = 0,4$$

Ответ:  $0,1$  и  $0,4$  (м).