

§ 1. Простейшие уравнения

I. Линейные уравнения

Решить уравнения.

1.1. $\frac{4}{5}x = 23\frac{1}{5}$.

1.2. $\frac{3}{5}x = -15\frac{3}{5}$.

1.3. $\frac{6}{7}x = 12\frac{6}{7}$.

1.4. $-\frac{4}{5}x = 21\frac{3}{5}$.

1.5. $-\frac{2}{3}x = -4\frac{2}{3}$.

1.6. $-\frac{7}{8}x = 23\frac{5}{8}$.

1.7. $-\frac{2}{5}x = -11\frac{1}{5}$.

1.8. $-\frac{2}{3}x = 7\frac{1}{3}$.

1.9. $\frac{3}{4}x = 2\frac{1}{4}$.

1.10. $3\frac{4}{7}x = -2\frac{1}{7}$.

1.11. $-1\frac{7}{11}x = 2\frac{5}{11}$.

1.12. $-1\frac{3}{7}x = 4\frac{2}{7}$.

2.1. $9x + 6 = 10x$.

2.2. $8x - 5 = 6x$.

2.3. $6x = x - 2$.

2.4. $5x - 3 = -10x$.

2.5. $2x + 7 = -2x$.

2.6. $-x - 2 = 9x$.

2.7. $-6x - 5 = 4x$.

2.8. $-9x - 8 = -8x$.

2.9. $-x - 7 = -5x$.

2.10. $-2x + 3 = -8x$.

2.11. $-1 + 2x = 10x + 3$.

2.12. $2 + 8x = 3x + 9$.

3.1. $7(-3 + 2x) = -6x - 1$.

3.2. $2(7 + 9x) = -6x + 2$.

3.3. $6(5 - 3x) = -8x - 7$.

3.4. $6(9 + 4x) = 4x - 4$.

3.5. $4(2 - 3x) = -7x + 10$.

3.6. $7(3 - 2x) = 12 - 8x$.

3.7. $-4(5 - 4x) = x + 1$.

3.8. $-6(9 - 5x) = 9x + 9$.

3.9. $-3(1 + 4x) = -4x - 5$.

3.10. $-6(-5 - 7x) = -8x + 2$.

3.11. $9 + 2(2x + 1) = 1$.

3.12. $4 + 5(-3x + 7) = -9$.

4.1. $3x - 2 - 3(x + 5) = -(2 - x) - 5$.

4.2. $x - 1 + (x + 2) = -4(-5 - x) - 5$.

4.3. $-2x + 1 - 3(x - 4) = 4(3 - x) + 4$.

4.4. $-2x + 1 + 5(x - 2) = -4(3 - x) + 1$.

$$4.5. -5x - 5 + 5(x - 5) = -(-5 - x) - 4.$$

$$4.6. 6x - 8(-7 + 9x) = -2(x + 4).$$

$$5.1. x - \frac{x}{9} = \frac{8}{3}.$$

$$5.2. x - \frac{x}{7} = -\frac{9}{14}.$$

$$5.3. x + \frac{x}{3} = -12.$$

$$5.4. x + \frac{x}{2} = -12.$$

$$5.5. \frac{x}{8} + \frac{x}{11} = -\frac{19}{11}.$$

$$5.6. \frac{x}{6} + \frac{x}{10} = \frac{16}{5}.$$

$$5.7. \frac{x}{5} + \frac{x}{9} = -\frac{14}{15}.$$

$$5.8. \frac{x}{8} + \frac{x}{6} = -\frac{7}{3}.$$

$$5.9. \frac{x}{6} + \frac{x}{12} + x = -\frac{35}{4}.$$

$$5.10. \frac{x}{2} + \frac{x}{6} + x = -\frac{5}{3}.$$

$$5.11. \frac{x}{5} + \frac{x}{3} + x = \frac{23}{5}.$$

$$5.12. \frac{x}{11} + \frac{x}{2} + x = \frac{35}{22}.$$

$$6.1. 4x + \frac{9 - 3x}{5} = \frac{10 + x}{3}.$$

$$6.2. \frac{1}{17}(x + 1) + \frac{15}{34} = \frac{1}{2}.$$

$$6.3. \frac{x + 0,5}{9} = \frac{x + 2}{2} - \frac{17}{18}.$$

$$6.4. 3 + \frac{4x - 9}{5} = \frac{5x + 9}{6}.$$

$$6.5. \frac{1}{2}(x - 8) + \frac{3}{10} = -0,2.$$

$$6.6. \frac{\frac{7}{3}x + 1}{7} = \frac{\frac{1}{2}x - 1}{21} + \frac{1}{15}.$$

II. Квадратные уравнения

Решить уравнения. Если уравнение имеет более одного корня, указать меньший из них.

$$7.1. \frac{1}{3}x^2 = 16\frac{1}{3}.$$

$$7.2. \frac{5}{18}x^2 = \frac{2}{45}.$$

$$7.3. 2\frac{2}{7}x^2 = 1\frac{2}{7}.$$

$$7.4. \frac{2}{9}x^2 = 1\frac{1}{8}.$$

$$7.5. 4\frac{10}{11}x^2 = 37\frac{1}{8}.$$

$$7.6. \frac{4}{9}x^2 = 1\frac{1}{2}.$$

$$7.7. 1\frac{17}{18}x^2 = 11\frac{1}{5}.$$

$$7.8. \frac{2}{13}x^2 = 1\frac{5}{8}.$$

$$7.9. 5\frac{5}{6}x^2 = \frac{21}{10}.$$

$$8.1. x^2 + 9x + 14 = 0.$$

$$8.2. x^2 + 12x + 32 = 0.$$

$$8.3. 2x^2 - 33x + 136 = 0.$$

$$8.4. 2x^2 - 27x + 88 = 0.$$

$$8.5. 2x^2 - 23x + 65 = 0.$$

$$8.6. 2x^2 - x - 55 = 0.$$

8.7. $2x^2 + 13x + 15 = 0$. **8.8.** $x^2 - 18x + 80 = 0$. **8.9.** $x^2 + 5x - 14 = 0$.

9.1. $(2x + 3)^2 + (x - 2)^2 = 13$. **9.2.** $(2x + 7)(7 - 2x) = 49 + x(x - 2)$.

9.3. $(x - 6)^2 = -24x$. **9.4.** $(3x - 2)^2 - (x + 1)^2 = 7$.

9.5. $(x + 3)(2 - 3x) = 13 - (x - 2)(2x + 1)$.

9.6. $(2x + 5)^2 - 2(x + 1)^2 = 9$. **9.7.** $x(x + 2) + 4x(x - 1) = 3(2x - 1)$.

9.8. $2(x^2 - 1) = 3 - x(2x + 1)$.

9.9. $(5x - 1)^2 - (3x + 2)^2 + (x - 1)(x + 1) = x - 4$.

9.10. $-2x^2 + 3x - 4 = -x^2 - x + (2 - x^2)$.

III. Дробно-линейные уравнения

Решить уравнения. Если уравнение имеет более одного решения, указать меньшее из них.

10.1. $\frac{1}{9x - 7} = \frac{1}{2}$. **10.2.** $\frac{1}{3x - 4} = \frac{1}{4x - 1}$. **10.3.** $\frac{1}{5 - 4x} = \frac{1}{3}$.

10.4. $\frac{3}{5 + 2x} = \frac{1}{4 + 3x}$. **10.5.** $\frac{3}{2x + 2} = \frac{1}{4}$. **10.6.** $\frac{2}{3x + 5} = \frac{4}{9x + 1}$.

10.7. $\frac{x - 13}{x + 5} = -2$. **10.8.** $\frac{x + 84}{x - 6} = -4$. **10.9.** $\frac{x - 19}{x + 5} = 4$.

10.10. $\frac{x - 40}{x + 5} = -4$. **10.11.** $\frac{x - 109}{x + 5} = -5$. **10.12.** $\frac{x + 13}{x + 6} = 2$.

11.1. $x = \frac{8x - 35}{x - 4}$. **11.2.** $x = \frac{9x + 15}{x + 11}$. **11.3.** $x = \frac{-3x - 16}{x - 13}$.

11.4. $x = \frac{2x + 18}{x - 1}$. **11.5.** $-x = \frac{x + 6}{x + 4}$. **11.6.** $-x = \frac{6x - 63}{x - 4}$.

12.1. $\frac{x^2 - 2x - 15}{x + 3} = 0$.

12.2. $\frac{2x^2 - 17x - 19}{x + 1} = 0$.

12.3. $\frac{4x^2 - x - 95}{4x + 19} = 0$.

12.4. $\frac{x^2 + 4x + 3}{x + 3} = 0$.

$$12.5. \frac{4x - 3x^2 + 4}{3x + 2} = 0.$$

$$12.7. \frac{8}{x^2 + x - 4} = 1.$$

$$12.9. \frac{2}{2x^2 - 3x + 2} = \frac{1}{11}.$$

$$12.6. \frac{16 - 9x^2 - 7x}{9x + 16} = 0.$$

$$12.8. \frac{11}{2x^2 + 5x - 7} = 1.$$

$$12.10. \frac{8}{x^2 - 7x + 4} = \frac{1}{8}.$$

Решить уравнения. Если уравнение имеет более одного корня, указать большее из них.

$$13.1. \frac{2x - 18}{x^2 - 13x + 36} = 1.$$

$$13.3. \frac{2 - 3x}{3x^2 + x - 2} = \frac{1}{2}.$$

$$13.5. \frac{3x^2 + 5x}{3x + 2} + 1 = \frac{-2}{2 + 3x}.$$

$$13.7. \frac{x^2 - 4x}{x - 3} - 1 = \frac{3}{3 - x}.$$

$$14.1. \frac{3}{x} = \frac{2}{3 - x}.$$

$$14.3. \frac{4}{3x - 1} = \frac{3}{2x + 5}.$$

$$14.5. \frac{3}{4x + 1} = \frac{2}{3(x - 2)}.$$

$$14.7. \frac{2x + 1}{3 - x} = \frac{4 - x}{x + 1}.$$

$$14.9. \frac{3x + 5}{2x + 1} = \frac{13 - x}{x + 2}.$$

$$13.2. \frac{x^2 + 2x - 15}{3x - 9} = -2.$$

$$13.4. \frac{x^2 + 9x + 18}{2x + 6} = 1,5.$$

$$13.6. \frac{2x^2 - 3x}{2x - 1} - 1 = \frac{1}{1 - 2x}.$$

$$13.8. \frac{2(x - 1)}{x} - 2x = \frac{x - 3}{x}.$$

$$14.2. \frac{5}{2x - 1} = \frac{8}{3x + 2}.$$

$$14.4. \frac{2}{3x - 4} = \frac{3}{5x + 4}.$$

$$14.6. \frac{2}{5 - 2x} = \frac{3}{2(x + 4)}.$$

$$14.8. \frac{3x + 2}{x + 3} = \frac{4x}{3x - 1}.$$

$$14.10. \frac{2x - 3}{x + 4} = \frac{4x - 6}{5x - 1}.$$