Алгебраические уравнения

(ОГЭ — № 4, № 21 — «Алгебра»)

Линейные.

1. $2 - 8x = 9(x + 4)$ $\{-2\}$.
2. $3x + 4(x - 9) = 5x + 2$ $\{19\}$.
3. $1 - 3x + 9(2x - 1) = 11x$ $\{2\}$.
4. $7x + 3(2x - 4) - 4(2 - 3x) = 5$ $\{1\}$.
5. $x(3x + 2) = 3(x^2 - x - 2)$ $\{-1,2\}$.
6. $x(2x + 1) = x(x + 3) + x^2 - 4$ $\{2\}$.
7. $3x - 2(x + 1) - 4(5 - 3x) = 4$ $\{2\}$.
8. $2(4 + 8x) - x = 1 - 3x - 2(x - 11)$ $\{0,75\}$.
9. $8(7 - 4x) - 7(4x + 1) + 5(8x - 1) = 19$ $\{1,25\}$.

10. $x - \dfrac{x}{6} = \dfrac{55}{6}$ $\{11\}$.

11. $x + \dfrac{x}{11} = \dfrac{24}{11}$ $\{2\}$.

12. $x - \dfrac{9x}{4} = \dfrac{1}{4}$ $\{-0,2\}$.

13. $x - \dfrac{x}{15} = \dfrac{14}{3}$ $\{5\}$.

14. $x + \dfrac{2}{9}x = \dfrac{121}{9}$ $\{11\}$.

15. $x - \dfrac{3}{14}x = \dfrac{33}{14}$ $\{3\}$.

16. $\dfrac{2}{x - 2} = \dfrac{4}{3}$ $\{3,5\}$.

17. $\dfrac{3}{1 - x} = \dfrac{2}{5}$ $\{-6,5\}$.

18. $\dfrac{x + 5}{2x - 6} = \dfrac{1}{4}$ $\{-13\}$.

19. $\dfrac{x + 1}{x - 1} = 2$ $\{3\}$.

20. $\dfrac{5 - x}{x - 11} = 5$ $\{10\}$.

21. $\dfrac{8 - x}{15 - x} = 8$ $\{16\}$.

22. $\dfrac{x - 6}{x - 8} = 5$ $\{8,5\}$.

23. $\dfrac{x + 2}{1 - 3x} = 1$ $\{-0,25\}$.

24. $\dfrac{7}{4x + 1} = -1$ $\{-2\}$.

25. $\dfrac{3}{2-x} = \dfrac{2}{3-x}$ $\hfill \{5\}.$

26. $\dfrac{2}{x+3} = \dfrac{2x-1}{x^2}$ $\hfill \{0{,}6\}.$

27. $x^2 - 6 = (x-2)^2$ $\hfill \{2{,}5\}.$
28. $x^2 - x + 9 = (x+2)^2$ $\hfill \{1\}.$
29. $4x^2 - x + 9 = (2x-3)^2$ $\hfill \{0\}.$
30. $x^2 + x + 7 = (x+2)^2$ $\hfill \{1\}.$
31. $4x^2 + 2x = (2x+1)^2$ $\hfill \{-0{,}5\}.$
32. $9x^2 + 2x - 3 = (1-3x)^2$ $\hfill \{0{,}5\}.$
33. $x(x-1) = (x-1)^2$ $\hfill \{1\}.$
34. $x(x+3) = (x+3)^2$ $\hfill \{-3\}.$
35. $x(x+2) = (x+2)^2$ $\hfill \{-2\}.$
36. $x(x+3) = (x+2)^2$ $\hfill \{-4\}.$

37. $(x+4)^2 = (2+x)^2$ $\hfill \{-3\}.$
38. $(x+10)^2 = (2-x)^2$ $\hfill \{-6\}.$
39. $(x-7)^2 = (9-x)^2$ $\hfill \{8\}.$
40. $(1-2x)^2 = (2x+1)^2$ $\hfill \{0\}.$
41. $(3-2x)^2 = (2x-1)^2$ $\hfill \{1\}.$
42. $(5+x)^2 - x^2 + (x-10)^2 = x^2$ $\hfill \{12{,}5\}.$
43. $(x-2)^2 + (x+1)^2 = 2(x-3)^2$ $\hfill \{1{,}3\}.$

Квадратные.

44. $x^2 + 10x + 24 = 0$ $\hfill \{-4; -6\}.$
45. $x^2 - 10x + 21 = 0$ $\hfill \{3; 7\}.$
46. $x^2 - 5x + 4 = 0$ $\hfill \{1; 4\}.$
47. $x^2 + x - 2 = 0$ $\hfill \{1; -2\}.$
48. $x^2 - 2x + 1 = 0$ $\hfill \{1\}.$
49. $9x^2 + 6x + 1 = 0$ $\hfill \left\{-\dfrac{1}{3}\right\}.$

50. $2x^2 - 3x + 1 = 0$ $\hfill \{0{,}5; 1\}.$

51. $x^2 + 10x + 3 = 17x - x^2$ $\hfill \{0{,}5; 3\}.$

52. $x^2 - 6x + 18 = x(14-x)$ $\hfill \{-9; 1\}.$

53. $x(x+1) = 45$ $\hfill \{-2{,}5; 1{,}5\}.$
54. $x(x-1) = x+8$ $\hfill \{-2; 4\}.$
55. $x(x-1) = 6$ $\hfill \{-2; 3\}.$
56. $x(x-5) = 2x - 12$ $\hfill \{3; 4\}.$

57. $x^2 - 2(x+3) = 2$ $\qquad\qquad\qquad\qquad\qquad\quad \{-2; 4\}.$

58. $x^2 + 2(x-8) + 1 = 0$ $\qquad\qquad\qquad\qquad\quad \{-5; 3\}.$

59. $x(x+3) + 2(2x+1) + 10 = 0$ $\qquad\qquad\quad \{-4; -3\}.$

60. $x(x+2) + x = 10$ $\qquad\qquad\qquad\qquad\qquad \{-5; 2\}.$

61. $x(x-4) + 4 = x$ $\qquad\qquad\qquad\qquad\qquad\quad \{1; 4\}.$

62. $x(x+8) = 12(x+1).$ $\qquad\qquad\qquad\qquad\quad \{-2; 6\}.$

63. $x(x-2) + 9x(1+x) + 1 = 0.$ $\qquad\quad \left\{-\dfrac{1}{2}; -\dfrac{1}{5}\right\}.$

64. $x(2-3x) + 4(x+1) = 3.$ $\qquad\qquad\quad \left\{1 \pm \dfrac{2\sqrt{3}}{3}\right\}.$

65. $5(x^2 - 17) = x(1 - 9x)$ $\qquad\qquad\quad \left\{-\dfrac{17}{7}; \dfrac{5}{2}\right\}.$

66. $3x^2 + 2x = (2x+1)^2$ $\qquad\qquad\qquad\qquad\quad \{-1\}.$

67. $2x^2 + 13x + 47 = (x+7)^2$ $\qquad\qquad\qquad \{-1; 2\}.$

68. $x(2x+11) = (x+6)^2 - 34$ $\qquad\qquad\quad \{-1; 2\}.$

69. $3x^2 - 4(4-x) = (4-x)^2$ $\qquad\qquad\quad \{-8; 2\}.$

70. $2x(2x+3) = (x-1)^2 + 2$ $\qquad\qquad\quad \left\{-3; \dfrac{1}{3}\right\}.$

71. $x^2 + 4x - \sqrt{x} = 5 + \sqrt{x}$ $\qquad\qquad\qquad\quad \{1\}.$

72. $x^2 + 3x - \sqrt{x+2} = \sqrt{x+2} + 10$ $\qquad\quad \{2\}.$

73. $x^2 - 3x - \sqrt{4-x} = 18 - \sqrt{4-x}$ $\qquad\quad \{-3\}.$

74. $2x^2 - 2 + \sqrt{x+1} = \sqrt{x+1} - 3x$ $\qquad \left\{\dfrac{1}{2}\right\}.$

75. $x(4x+1) + \sqrt{-x} = 5 + \sqrt{-x}$ $\qquad\quad \{-1{,}25\}.$

76. $x^2 + 7x + \sqrt{2x+3} = 18 + \sqrt{2x+3}$ $\qquad \{2\}.$

77. $3x^2 - \sqrt{0{,}5-x} = x - \sqrt{0{,}5-x} + 2$ $\qquad \left\{-\dfrac{2}{3}\right\}.$

78. $x^2 - 8x + \sqrt{x-5} = 12x - 18 - x^2 + \sqrt{x-5}$ $\quad \{9\}.$

79. $8x^2 + 12x + \sqrt{x} = 45 - 4x^2 + \sqrt{x}$ $\qquad \{1{,}5\}.$

80. $\dfrac{1}{3}x^2 - 27 = 0$ $\qquad\qquad\qquad\qquad\qquad \{\pm 9\}.$

81. $\dfrac{1}{2}x^2 - 50 = 0$ $\qquad\qquad\qquad\qquad\quad \{\pm 10\}.$

82. $20 - \dfrac{1}{5}x^2 = 0$ $\qquad\qquad\qquad\qquad\quad \{\pm 10\}.$

83. $-\dfrac{16}{7}x^2 + 28 = 0$ $\hfill \{\pm 7\}.$

84. $45 - \dfrac{4x^2}{5} = 0$ $\hfill \{\pm 7{,}5\}.$

85. $-\dfrac{25}{3}x^2 + 27 = 0$ $\hfill \{\pm 1{,}8\}.$

86. $x - \dfrac{12}{x} = 4$ $\hfill \{-2; 6\}.$

87. $\dfrac{1}{x} + 2 = 3x$ $\hfill \left\{-\dfrac{1}{3}; 1\right\}.$

88. $x + \dfrac{1}{x} = 2{,}5$ $\hfill \left\{\dfrac{1}{2}; 2\right\}.$

89. $x + 7 + \dfrac{6}{x} = 0$ $\hfill \{-6; -1\}.$

Разложения.

90. $(2x + 4)(9 - 3x) = 0$ $\hfill \{-2; 3\}.$

91. $(4x + 20)(3 - 6x) = 0$ $\hfill \{-5; 0{,}5\}.$

92. $x^2 - x = 0$ $\hfill \{0; 1\}.$

93. $x^3 - 7x^2 = 0$ $\hfill \{0; 7\}.$

94. $5x^2 - 45x = 0$ $\hfill \{0; 9\}.$

95. $2x^2 + 16x = 0$ $\hfill \{-8; 0\}.$

96. $3x^2 = 21x$ $\hfill \{0; 7\}.$

97. $8x^2 = 40x$ $\hfill \{0; 5\}.$

98. $15x = 5x^2$ $\hfill \{0; 3\}.$

99. $x(x^2 + x - 12) = 0$ $\hfill \{-4; 0; 3\}.$

100. $(x - 3)(x^2 + 8x - 9) = 0$ $\hfill \{-9; 1; 3\}.$

101. $(x + 2)(2x^2 + 3x - 2) = 0$ $\hfill \left\{-2; -2; \dfrac{1}{2}\right\}.$

102. $(x^2 - 4x + 3)(x^2 - 3x) = 0$ $\hfill \{0; 1; 3; 3\}.$

103. $(x - 1)(3x^2 + 2x - 1) = 0$ $\hfill \left\{-1; \dfrac{1}{3}; 1\right\}.$

104. $(2x - 7)(8x^2 + 2x - 1) = 0$ $\hfill \left\{-\dfrac{1}{2}; \dfrac{1}{4}; 3\dfrac{1}{2}\right\}.$

105. $(x^2 - 4)(x^2 - 8x + 9) = 0$ $\hfill \{\pm 2; 4 \pm \sqrt{7}\}.$

106. $(x - 3)^2(x - 5) = 35(x - 3)$ $\hfill \{-2; 3; 10\}.$

107. $(x + 3)^3 = 81(x + 3)$ $\hfill \{-12; -3; 6\}.$

108. $x(x^2 + 2x + 1) = 2(x + 1)$ $\hfill \{-2; -1; 1\}.$

109. $(x - 2)^2(x + 3) = (x - 2)(x + 3)^2$ $\hfill \{-3; 2\}.$

110. $(2x - 5)^2(3x + 2) = (2x - 5)(3x + 2)^2$ $\hfill \left\{-7; -\dfrac{2}{3}; 2{,}5\right\}.$

111. $(3x - 4)^2(2x + 3) = (3x - 4)(2x + 3)^2$ $\qquad \left\{ -\frac{3}{2}; \frac{4}{3}; 7 \right\}.$

112. $(x + 3)^2(4x - 1) = (x + 3)(4x - 1)$ $\qquad \left\{ -3; -2; \frac{1}{4} \right\}.$

113. $(3x + 1)^2(x + 1) = (3x + 1)(x + 1)$ $\qquad \left\{ -1; -\frac{1}{3}; 0 \right\}.$

114. $(2x + 3)^2(x - 2)^2 = (2x + 3)(x - 2)$ $\qquad \left\{ -\frac{3}{2}; 2; \frac{1 \pm \sqrt{57}}{4} \right\}.$

115. $(2x - 3)^2(x + 2)^2 = (2x - 3)(x + 2)$ $\qquad \left\{ -2; \frac{3}{2}; \frac{-1 \pm \sqrt{57}}{4} \right\}.$

116. $x^3 + 11x^2 - x - 11 = 0$ $\qquad \{ -11; -1; 1 \}.$

117. $x^3 + 5x^2 = 9x + 45$ $\qquad \{ -5; -3; 3 \}.$

118. $x^3 + 6x^2 = 4x + 24$ $\qquad \{ -6; -2; 2 \}.$

119. $x^3 - 3x^2 - 64x + 192 = 0$ $\qquad \{ -8; 3; 8 \}.$

120. $x^3 - 2x^2 - 81x + 162 = 0$ $\qquad \{ -9; 2; 9 \}.$

121. $x^3 - 6x^2 + 2x - 12 = 0$ $\qquad \{ 6 \}.$

122. $2x^3 + x^2 + 12x + 6 = 0$ $\qquad \left\{ -\frac{1}{2} \right\}.$

123. $3x^3 + 12x^2 = 2x + 8$ $\qquad \left\{ -4; \pm\sqrt{\frac{2}{3}} \right\}.$

124. $2x^3 - 4x^2 = 3x - 6$ $\qquad \left\{ \pm\sqrt{\frac{3}{2}}; 2 \right\}.$

125. $4x^3 - 12x = 3x^2 - 9$ $\qquad \left\{ \frac{3}{4}; \pm\sqrt{3} \right\}.$

126. $x^4 = (x - 20)^2$ $\qquad \{ -5; 4 \}.$

127. $x^4 = (2x - 99)^2$ $\qquad \{ -11; 9 \}.$

128. $x^4 = (56 - x)^2$ $\qquad \{ -8; 7 \}.$

129. $x^4 = (3x - 154)^2$ $\qquad \{ -14; 11 \}.$

130. $x^4 = (5 - 4x)^2$ $\qquad \{ -5; 1 \}.$

131. $x^4 = (3x - 10)^2$ $\qquad \{ -5; 2 \}.$

132. $x^4 = (1 - 2x)^2$ $\qquad \{ 1; 1 \pm \sqrt{2} \}.$

133. $x^4 = (x - 5)^2$ $\qquad \left\{ \frac{-1 \pm \sqrt{21}}{2} \right\}.$

134. $x^4 = (2 - 3x)^2$ $\qquad \left\{ 1; 2; \frac{-3 \pm \sqrt{17}}{2} \right\}.$

135. $(x-2)(2x^2 - x - 10) = 3(x+2)$ $\qquad$ $\{-2; 0{,}5; 4\}.$

136. $x(2x^2 + 3x - 2) = x^2 - 4$ $\qquad$ $\{-2\}.$

137. $(x-2)(2x^2 - x - 10) = x^2 - 4$ $\qquad$ $\{-2; 2; 3{,}5\}.$

138. $x(x+2)\left(x - \dfrac{5}{2}\right) = x^2 - 4$ $\qquad$ $\left\{-2; \dfrac{7 \pm \sqrt{17}}{4}\right\}.$

139. $(x+3)\left(x^2 - 6x + 5\right) = (x-1)^2$ $\qquad$ $\left\{1; \dfrac{3 \pm \sqrt{65}}{2}\right\}.$

140. $(x^2 - 1)^2 + (x^2 - 6x + 7)^2 = 0$ $\qquad$ $\{-1\}.$

141. $(x^2 - 4)^2 + (x^2 + 4x - 12)^2 = 0$ $\qquad$ $\{2\}.$

142. $(4x^2 - 1)^2 + (2x^2 + x - 1)^2 = 0$ $\qquad$ $\left\{\dfrac{1}{2}\right\}.$

143. $(x^2 - 9)^2 + (x^2 + 5x + 6)^2 = 0$ $\qquad$ $\{-3\}.$

144. $\sqrt{x^2 - 1} + (3x^2 - 2x - 1)^2 = 0$ $\qquad$ $\{1\}.$

Подстановка.

145. $x^4 - 5x^2 + 4 = 0$ $\qquad$ $\{-1; 1; -2; 2\}.$

146. $x^4 - 13x^2 + 36 = 0$ $\qquad$ $\{\pm 2; \pm 3\}.$

147. $x^4 - 2x^2 - 8 = 0$ $\qquad$ $\{\pm 2\}.$

148. $x^4 - 6x^2 - 27 = 0$ $\qquad$ $\{\pm 3\}.$

149. $x^4 - 6x^2 + 9 = 0$ $\qquad$ $\{\pm\sqrt{3}\}.$

150. $x^4 + 3x^2 - 40 = 0$ $\qquad$ $\{\pm\sqrt{5}\}.$

151. $2(x+4)^4 - 7(x+1)^2 - 4 = 0$ $\qquad$ $\{-3; 1\}.$

152. $(x-3)^4 - 3(x-3)^2 - 10 = 0$ $\qquad$ $\{3 \pm \sqrt{5}\}.$

153. $(x+3)^4 + 2(x+3)^2 - 8 = 0$ $\qquad$ $\{-3 \pm \sqrt{2}\}.$

154. $(x+3)^4 - 3(x+3)^2 + 2 = 0$ $\qquad$ $\{-4; -2; -3 \pm \sqrt{2}\}.$

155. $(2x-1)^4 = 18 + (2x-1)^2$ $\qquad$ $\{-1; 2\}.$

156. $2(x+6)^4 = 7(x+6)^2 + 4$ $\qquad$ $\{-8; -2\}.$

157. $(x+2)^2\left((x+2)^2 + 2\right) = 3$ $\qquad$ $\{-3; -1\}.$

158. $(2x-3)^2\left(3 + (2x-3)^2\right) = 4$ $\qquad$ $\{1; 2\}.$

159. $(2x+1)^2\left(2 + 3(1+2x)^2\right) = 1$ $\qquad$ $\{-1; 0\}.$

160. $(x-2)^2\left((2-x)^2 - 1\right) = 12$ $\qquad$ $\{0; 4\}.$

161. $\dfrac{40}{(x+1)^2} + \dfrac{3}{x+1} - 1 = 0$ $\hfill \{-6; 7\}.$

162. $\dfrac{6}{(x-3)^2} + \dfrac{7}{x-3} + 1 = 0$ $\hfill \{-3; 2\}.$

163. $\dfrac{54}{(x+2)^2} - \dfrac{3}{x+2} - 1 = 0$ $\hfill \{-16; 9\}.$

164. $\dfrac{24}{(x-1)^2} + \dfrac{11}{x-1} + 1 = 0$ $\hfill \{-7; -2\}.$

165. $\dfrac{5}{(x+1)^2} - \dfrac{4}{x+1} = 1$ $\hfill \{-6; 0\}.$

166. $\dfrac{2}{(x+5)^2} - \dfrac{3}{x+5} = 2$ $\hfill \{-7; -4{,}5\}.$

167. $\dfrac{1}{(x-3)^2} - \dfrac{3}{x-3} = 4$ $\hfill \{2; 3{,}25\}.$

168. $\dfrac{1}{x^4} - \dfrac{1}{x^2} - 6 = 0$ $\hfill \left\{\pm\dfrac{\sqrt{3}}{3}\right\}.$

169. $\dfrac{36}{(x-4)^4} + \dfrac{5}{(x-4)^2} = 1$ $\hfill \{1; 7\}.$

170. $x + 3\sqrt{x} - 4 = 0$ $\hfill \{1\}.$

171. $x + 5\sqrt{x} = 24$ $\hfill \{9\}.$

172. $\dfrac{18}{\sqrt{x}} + 7 = \sqrt{x}$ $\hfill \{81\}.$

173. $\dfrac{x+1}{x} - \sqrt{\dfrac{x+1}{x}} - 2 = 0$ $\hfill \left\{\dfrac{1}{3}\right\}.$

Рациональные.

174. $\dfrac{x^2 - 6x + 8}{x - 2} = 0$ $\hfill \{4\}.$

175. $\dfrac{x(x+3) - 10}{x + 5} = 0$ $\hfill \{2\}.$

176. $\dfrac{x^3 - 4x^2 + 3x}{x - 3} = 0$ $\hfill \{0; 1\}.$

177. $\dfrac{x^2 - 4(x+3)}{x + 2} = 0$ $\hfill \{6\}.$

178. $\dfrac{4x^2 - 7x - 2}{x^2 - 5x + 6} = 0$ $\hfill \left\{-\dfrac{1}{4}\right\}.$

179. $\dfrac{x(x-7)}{x+2} + \dfrac{6(x-1)}{x+2} = 0$ $\hfill \{3\}.$

180. $3(x-2) - \dfrac{16}{x-3} = 1$ $\hfill \left\{\dfrac{1}{3}; 5\right\}.$

181. $\dfrac{x\,(x+2)}{4-x}=4$ $\{-8;2\}.$

182. $\dfrac{x^2+3x}{x+3}=-4$ $\{-4\}.$

183. $\dfrac{x^2-x}{x-1}=2$ $\{2\}.$

184. $\dfrac{x}{x^2-16}+\dfrac{x-1}{x+4}=1$ $\{5\}.$

185. $\dfrac{1}{x-3}+\dfrac{1}{x}=\dfrac{1}{2}$ $\{1;6\}.$

186. $\dfrac{x}{x-3}+\dfrac{x+1}{x+3}=\dfrac{6x}{x^2-9}$ $\left\{-\dfrac{1}{2}\right\}.$

187. $\dfrac{13}{x-2}=2-\dfrac{2}{x-13}$ $\{7{,}5;15\}.$

188. $\dfrac{15}{x-2}=\dfrac{42+x}{x}$ $\{-28;3\}.$

189. $\dfrac{x^2}{x+5}=\dfrac{25}{x+5}$ $\{5\}.$

190. $\dfrac{2x+1}{2x^2+3x+1}=1$ $\{0\}.$

191. $\dfrac{x}{x-2}+\dfrac{3}{x}=\dfrac{3}{x-2}.$ $\{\pm\sqrt{6}\}.$

192. $\dfrac{2}{x-5}+\dfrac{14}{x}=3.$ $\{3\tfrac{1}{3};7\}.$

193. $\dfrac{x^2-1}{x}=x^2-\dfrac{1}{x}$ $\{1\}.$

194. $\dfrac{1}{x^2-3x+2}=\dfrac{1}{2x^2-3x+1}$ $\{-1\}.$

195. $\dfrac{x+2}{x-2}-\dfrac{x(x-4)}{x^2-4}=\dfrac{x-2}{x+2}-\dfrac{4(3+x)}{4-x^2}$ $\{6\}.$

196. $\dfrac{x+5}{x+2}+\dfrac{1}{(x+1)(x+2)}=\dfrac{1}{x+1}$ $\{-4\}.$

197. $\dfrac{x^2-2x-5}{(x-3)(x-1)}+\dfrac{1}{x-3}=1$ $\{\varnothing\}.$