9. ESERCIZI

POTENZE

LIVELLO BASE

Tenendo presente che $\sqrt[n]{x^m} = x^{\frac{m}{n}}$, scrivi le seguenti potenze sotto forma di radice:

1. $3^{\frac{5}{8}}$; $4^{\frac{2}{3}}$; $\left(\frac{1}{3}\right)^{\frac{3}{2}}$

2. $2^{-\frac{4}{3}}$; $\left(\frac{1}{4}\right)^{-\frac{2}{3}}$; $\left(\frac{11}{3}\right)^{-\frac{2}{5}}$

Scrivi le seguenti radici sotto forma di potenza con esponente razionale:

3. $\sqrt[6]{2^5}$; $\sqrt[4]{243}$; $\sqrt[4]{0.25}$;

4. $\frac{1}{\sqrt[4]{2}}$; $\sqrt[19]{\frac{1}{256}}$; $\sqrt[7]{\frac{1}{125}}$.

LIVELLO INTERMEDIO

5. $3^{\frac{3}{4}} \cdot 3^{\frac{1}{2}}$

6. $2^{-1} : 2^{\frac{3}{2}} \cdot 4^{\frac{3}{2}}$

7. $5^{\frac{1}{2}} \cdot \left(5^{\frac{2}{9}}\right)^{\frac{3}{4}}$

8. $(7^{-2} \cdot 7^{-1})^{\frac{1}{6}} : 7^{-\frac{1}{4}} \cdot (7^3)^{-\frac{1}{2}}$ $S = \left\{\frac{1}{7\sqrt[4]{7^3}}\right\}$

9. $\left[\left(3^{\frac{1}{3}} x^{-2} y^{\frac{1}{2}} z^3\right)^{\frac{1}{3}}\right]^{\frac{9}{2}} \cdot \left(3^{-\frac{1}{2}} x^3 y^{-\frac{3}{4}} z^{-\frac{9}{2}}\right)$ $S = \{1\}$

10. $\left\{\left[\left(a^{\frac{1}{3}} \cdot a\right)^{\frac{1}{3}} \cdot \left(a^{\frac{5}{3}} \cdot a^{-2}\right)^{\frac{1}{3}}\right]^6\right\}^{-\frac{1}{2}} \cdot \left[(a^3 b)^{-\frac{2}{3}}\right]^{-\frac{3}{4}}$ $S = \{\sqrt{ab}\}$

LOGARITMI

LIVELLO BASE

Basandoti sulla sola definizione di logaritmo, calcola i seguenti logaritmi:

11. $\log_2 8 =$ $\log_2 \frac{1}{8} =$ $\log_2 1 =$

12. $\log_2 \sqrt[3]{16} =$ $\log_{\frac{1}{3}} 27 =$ $\log_{\frac{2}{3}} \sqrt[5]{\frac{9}{4}} =$

13. $\log_5 \frac{1}{25} =$ $\log_{\frac{1}{2}} 2\sqrt[3]{2} =$ $\log_{\sqrt[3]{2}} 8 =$

14. $\log_3 81 =$ $\log_{\frac{1}{3}} \frac{1}{\sqrt{27}} =$ $\ln \sqrt[5]{e^4} =$

Determina il valore dell'argomento x, conoscendo il logaritmo e la base:

15. $\log_3 x = 2$ $\log_2 x = \frac{1}{8}$ $\log_{\frac{1}{3}} x = 4$

16. $\log_{\sqrt{2}} x = -2$ $\log_{\sqrt{3}} x = \frac{4}{3}$ $\log_{0,2} x = 1$

17. $\log_5 x = -1$ $\log_{\sqrt{2}} x = 2$ $\log_{27} x = \frac{3}{2}$

18. $\log_{100} x = \frac{1}{2}$ $\log_8 x = -\frac{3}{2}$ $\ln x = -2$

Determina la base dei seguenti logaritmi:

19. $\log_x 16 = 2$ $\log_x \frac{1}{27} = -3$ $\log_x \frac{27}{8} = -3$

20. $\log_x \frac{1}{3} = 2$ $\log_x \sqrt[4]{8} = \frac{4}{3}$ $\log_x \sqrt[5]{16} = \frac{4}{5}$

21. $\log_x 4 = 4$ $\log_x \frac{1}{4} = -4$ $\log_x 2 = 3$

22. $\log_x \sqrt{27} = \frac{1}{2}$ $\log_x 32 = -5$ $\log_x 9 = 1$

In base all'identità $a^{\log_a b} = b$ determina:

23. $2^{\log_2 16} =$ $\quad 5^{-\log_5 3} =$ $\quad 3^{\log_3 1.5} =$

24. $49^{\log_7 3} =$ $\quad 3^{3\log_3 5} =$ $\quad 16^{\log_2 3} =$

Trasforma i seguenti logaritmi in somme algebriche di più logaritmi utilizzando le proprietà studiate (si supponga che $a>0; b>0; c>0$ e $\alpha \in \Re^+ - \{1\}$):

25. $\log_\alpha (ab)$ $\quad \log_\alpha \left(a^3 b^2\right)$ $\quad \log_\alpha (ab)^3$

26. $\log_\alpha \sqrt{ab}$ $\quad \log_\alpha \dfrac{a^2 b}{c}$ $\quad \log \sqrt{\dfrac{a}{bc}}$

27. $\log \sqrt{a^2 b}$ $\quad \log\left(3ab^3 c^{-1}\right)$ $\quad \log\left(2a\sqrt{b}c^3\right)$

Riduci ad un unico logaritmo le seguenti espressioni nell'ipotesi che tutte le lettere che compaiono come argomenti dei logaritmi rappresentino valori positivi e che $\alpha \in \Re^+ - \{1\}$:

28. $\log_\alpha a + \log_\alpha b - \log_\alpha a^2$ $\quad 2\log_\alpha a - \log_a a^3$

29. $\dfrac{1}{2}\log_\alpha 64 + \log_\alpha 6$ $\quad \dfrac{1}{2}\left[\log_\alpha \left(x^2-1\right) - \log_\alpha (x-1)\right]$ con $x>1$

30. $\log_\alpha 6 - \lg_\alpha 3 + \log_\alpha 2$ $\quad \log_\alpha \left(x^2 - 2x + 1\right)$ con $x \neq 1$

31. $\dfrac{1}{2}\log(1-a) - \dfrac{1}{2}\log\left(1-a^2\right) + 2\log a$ $\quad \dfrac{1}{2}(\log x - 2\log y) + 3\left(\log x - \dfrac{1}{2}\log y\right)$

Calcola, applicando le proprietà dei logaritmi, il valore delle seguenti espressioni:

32. $\log_2 2\sqrt{8}$ $\quad \log_2 \dfrac{4\sqrt{2}}{\sqrt[3]{2}}$ $\quad \log_9 \sqrt{3\sqrt[3]{9}}$

33. $\log_3 \dfrac{27\sqrt{3}}{\sqrt{3^7}}$ $\quad \log_3 \sqrt{\dfrac{81\sqrt{3}}{27\sqrt{\dfrac{1}{3}}}}$ $\quad \log_{\frac{1}{2}} \left(16\sqrt{\dfrac{2\sqrt{2}}{\sqrt[3]{2^2}}}\right)$

34. $\log_2 \dfrac{8\sqrt{2}}{\sqrt[3]{16}}$ $\quad \log_5 \sqrt{5\sqrt{5\sqrt{5}}}$ $\quad \log_3 \sqrt{\dfrac{9\sqrt[3]{3}}{\sqrt{3}}}$

EQUAZIONI ESPONENZIALI

Risolvi le seguenti equazioni esponenziali:

LIVELLO BASE

35. a) $2^x = 128$ b) $2^x = \frac{1}{32}$ $S(a) = \{7\};\ S(b) = \{-5\}$

36. a) $\left(\frac{3}{5}\right)^x = \frac{125}{27}$ b) $\left(\frac{9}{16}\right)^x = \frac{4}{3}$ $S(a) = \{-3\};\ S(b) = \left\{-\frac{1}{2}\right\}$

37. a) $2^x = -\frac{1}{32}$ b) $2^{x^2} \cdot 2^x = 4$ $S(a) = \{\emptyset\};\ S(b) = \{-2; 1\}$

38. a) $2^{x-1} = \frac{3^x}{3}$ b) $5^{x+3} = 2^x \cdot 8$ $S(a) = \{1\};\ S(b) = \{-3\}$

39. a) $3^{2x-3} = \frac{1}{3}$ b) $5^{x^2+x} = 25$ $S(a) = \{1\};\ S(b) = \{-2; 1\}$

40. a) $27^{x-1} = \sqrt[3]{3^{x-3}}$ b) $4^{x+2} = \sqrt[3]{2^{x+7}}$ $S(a) = \left\{\frac{3}{4}\right\};\ S(b) = \{-1\}$

41. a) $12^x + 12 = 0$ b) $2^3 \cdot 2^{x+1} = \frac{2^{6x}}{2^4}$ $S(a) = \{\emptyset\};\ S(b) = \left\{\frac{8}{5}\right\}$

42. a) $2^{x^2-3x} = 1$ b) $\left(\frac{3}{4}\right)^{x^3-3x+1} = -\frac{3}{4}$ $S(a) = \{0; 3\};\ S(b) = \{\emptyset\}$

43. a) $49^x = 7 \cdot 7^{x^2+1}$ b) $9^{x(1-x)} = \frac{9}{27^x}$ $S(a) = \{\emptyset\};\ S(b) = \left\{\frac{1}{2}; 2\right\}$

44. a) $\sqrt{3^x} = \frac{9^x}{27}$ b) $5^{x^2-1} = 125$ $S(a) = \{2\};\ S(b) = \{-2; 2\}$

45. a) $9^{1-x} \cdot 3 = 27$ b) $\left(\frac{2}{3}\right)^x = \left(\frac{9}{4}\right)^{x+1} \cdot \left(\frac{2}{3}\right)^{-1}$ $S(a) = \{0\};\ S(b) = \{-1\}$

46. a) $3^{3x-2} \cdot 9^{1-x} = \sqrt{27}$ b) $\left(\frac{2}{5}\right)^x \cdot \left(\frac{4}{25}\right)^{2x+2} = \left(\frac{8}{125}\right)^{3x}$ $S(a) = \left\{\frac{3}{2}\right\};\ S(b) = \{1\}$

47. a) $\frac{1}{7^{2x+1}} = \frac{1}{49^x} \cdot 7^{x-\frac{1}{2}}$ b) $6^{x+2} \cdot \sqrt{6} = \frac{1}{6^{2x+2}}$ $S(a) = \left\{-\frac{1}{2}\right\};\ S(b) = \left\{-\frac{3}{2}\right\}$

LIVELLO INTERMEDIO

48. **a)** $\sqrt{2\sqrt[3]{2}} = 8^{x-3}$ **b)** $\frac{1}{3\sqrt{3}} \cdot 9^x = \frac{27}{3^x}$ $S(a) = \left\{\frac{29}{9}\right\};\ S(b) = \left\{\frac{3}{2}\right\}$

49. **a)** $2^{x-4} \cdot \sqrt{4^{x+1}} = \frac{4^{x^2}}{8^x}$ **b)** $\frac{\sqrt{27^{x-2}}}{\left(3^{x+2}\right)^{\frac{x}{2}}} = \left(\frac{1}{27}\right)^2$ $S(a) = \left\{1;\ \frac{3}{2}\right\};\ S(b) = \{-2; 3\}$

50. **a)** $2^x \cdot 9^{\frac{x}{2}} = 6$ **b)** $\frac{6^{x-1} \cdot 3^x}{2^{x+1}} = 12^{x-1}$ $S(a) = \{1\};\ S(b) = \{0\}$

51. **a)** $36^x - 6^{x+1} = 0$ **b)** $4^x + 2^{x+1} = 2^3$ $S(a) = \{1\};\ S(b) = \{1\}$

52. **a)** $2^{2x} - 2 \cdot 2^x - 8 = 0$ **b)** $9^x + 3 \cdot 3^x - 4 = 0$ $S(a) = \{2\};\ S(b) = \{0\}$

53. $\left(\sqrt{3}\right)^x + \left(\sqrt{3}\right)^{x+1} = \sqrt{3} + 1$ $S = \{0\}$

54. $3^{x-1} = 2^x$ $S = \left\{\frac{Log3}{Log3 - Log2}\right\}$

55. $2^{x-1} \cdot 3^x = \frac{1}{5}$ $S = \left\{\frac{Log2 - Log5}{Log6}\right\}$

56. $2 \cdot 2^x - 5 = 0$ $S = \left\{\frac{Log5}{Log2} - 1\right\}$

57. $3^{x-3} \cdot 3^x - 4 = 0$ $S = \left\{\frac{2Log2 + 3Log3}{2Log3}\right\}$

58. $9^x + \left(3^x\right)^2 - 3^{2(x-2)} = 161$ $S = \{2\}$

59. $5 \cdot 5^{2x} + 4 \cdot 5^x - 1 = 0$ $S = \{-1\}$

60. $2^{x+2} = 5^{1-x}$ $S = \{Log5 - 2Log2\}$

61. $4^{2x} - 9 \cdot 4^x + 8 = 0$ $S = \left\{0;\ \frac{3}{2}\right\}$

62. $3 \cdot 7^x + 7^{x+1} = 10\sqrt{7}$ $S = \left\{\frac{1}{2}\right\}$

63. $3^x + 3^{x+1} = -3^{x-1} + 13$ $S = \{1\}$

64. $4^x + 4^{x-1} = 10$ $S = \left\{\frac{3}{2}\right\}$

65. $\frac{\sqrt{6^{x^2-x}}}{6}=\frac{1}{36^{2-x}}$ $S=\{2;3\}$

LIVELLO AVANZATO

66. $5^{x(x-2)}\cdot\frac{1}{5^x}=25^{-x}$ $S=\{0;1\}$

67. $2\cdot 3^x+3^{x+1}=7$ $S=\left\{\frac{Log7-Log5}{Log3}\right\}$

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

69. $5^{x+2}+5^{x+1}+5^x=62$ $S=\left\{\frac{\ln 2}{\ln 5}\right\}$

70. $3\cdot e^{2x}-1=e^x$ $S=\left\{\ln\frac{1+\sqrt{13}}{6}\right\}$

71. $16\left(\frac{1}{4}\right)^x-10\left(\frac{1}{2}\right)^x+1=0$ $S=\{1;3\}$

72. $\frac{3^{x-1}\cdot 4^{x+1}}{5^2}=2$ $S=\left\{\frac{2Log5+Log3-Log2}{2Log2+Log3}\right\}$

73. $\frac{32-3^x}{5+3^{-x}}=\frac{9}{2}$ $S=\left\{2;-\frac{Log2}{Log3}\right\}$

74. $\frac{9^{x+\frac{1}{2}}+3^{2x-1}}{5^{x+1}}=2$ $S=\left\{\frac{Log3}{Log9-Log5}\right\}$

75. $\left|9^x-2\cdot 3^x\right|-3=0$ $S=\{1\}$

EQUAZIONI LOGARITMICHE

Risolvi le seguenti equazioni logaritmiche:

LIVELLO BASE

76. $\log_3(2x-1)=2$ $S=\{5\}$

77. $\log_{\frac{1}{3}}(x-4)=0$ $S=\{5\}$

78. $\log_{\frac{1}{2}}(7x+2)=1$ $S=\left\{-\frac{3}{14}\right\}$

79. $\log_6\left(4x^2-51x+36\right)=2$ $S=\left\{0;\frac{51}{4}\right\}$

80. $\mathrm{Log}\left(x^2+19\right)=2$ $S=\{\pm 9\}$

81. $\log_2(x-1)=1$ $S=\{3\}$

82. $\log_2\left(x^2-4x+4\right)=0$ $S=\{1;\ 3\}$

83. $\ln(x-1)-\ln(4-3x)=0$ $S=\left\{\frac{5}{4}\right\}$

84. $\mathrm{Log}x-\mathrm{Log}\left(x^2-2\right)=0$ $S=\{2\}$

85. $\log_{\frac{1}{3}}\sqrt{x}=2$ $S=\left\{\frac{1}{81}\right\}$

86. $\log_2(2x-1)=\log_2(x+3)$ $S=\{4\}$

87. $\log_2\left(x^2+1\right)=3$ $S=\{\pm\sqrt{7}\}$

88. $\log_4(2x-1)=\log_4(x+1)$ $S=\{2\}$

89. $\log_3\left(x^2-3x\right)=0$ $S=\left\{\frac{3\pm\sqrt{13}}{2}\right\}$

90. $\log_7(12-x)-\log_7(2x+3)=0$ $S=\{3\}$

91. $\log_5\left(x^2-4x+4\right)=1$ $S=\{2\pm\sqrt{5}\}$

92. $\log_{\frac{1}{2}}(x+1)-\log_{\frac{1}{2}}(5-x)=0$ $S=\{2\}$

93. $\log_2 x^2=2$ $S=\{\pm 2\}$

94. $\log_{\sqrt{3}} x=-4$ $S=\left\{\frac{1}{9}\right\}$

95. $\log_2\left(x^2+3x+4\right)=2$ $S=\{0;\ -3\}$

96. $\log_{\frac{4}{3}}\left(x^2-x+1\right)=-1$ $S=\left\{\frac{1}{2}\right\}$

97. $\ln(3-2x)-\ln(2x+3)=0$ $S=\{0\}$

LIVELLO INTERMEDIO

98. $\log_2 x+\log_2(x-4)=5$ $S=\{8\}$

99. $3\log_2 x=1+\log_2(7x+4)$ $S=\{4\}$

100. $2\log_2(x+1)=3$ $S=\{2\sqrt{2}-1\}$

101. $\log_{\frac{1}{2}} x=-3-\log_{\frac{1}{2}}(x-2)$ $S=\{4\}$

102. $\mathrm{Log}(5-x)-\mathrm{Log}(10-2x)=\mathrm{Log}4$ $S=\{\emptyset\}$

103. $2\ln x=\ln(x-3)-2\ln\frac{1}{4}$ $S=\{4;12\}$

104. $\log_3 x-\log_3(x-1)-\log_3 7+\log_3 6=0$ $S=\{7\}$

105. $\log_2 x+4=2\log_2(x+4)$ $S=\{4\}$

106. $\log_3\left(27x^2\right)-\log_3 x-3=0$ $S=\{1\}$

107. $2-\log_{\frac{1}{2}}(x-5)=\log_{\frac{1}{2}}(5-x)$ $S=\{\emptyset\}$

108. $\log_3 x^4-\log_3 x^3-2=0$ $S=\{9\}$

109. $\ln x+\ln(x+2)=\ln 2x$ $S=\{\emptyset\}$

110. $\ln(\mathrm{x}+3)+\ln \mathrm{x}=\ln 4$ $S=\{1\}$

111. $\log_7 x+\log_7(18x+61)=1$ $S=\left\{\frac{1}{9}\right\}$

112. $\log_5\left(x^2-12\right)=\log_5\left(x^2+4\right)-1$ $S=\{\pm 4\}$

113. $2\log_4 x - 2\log_4(x+3) + 1 = 0$ $S = \{3\}$

114. $\ln(x^2 - x + 2) - \ln(x+3) = \ln(2x+4)$ $S = \{-1\}$

115. $\mathrm{Log}(x^2 + 5x - 4) - \mathrm{Log}(x+2) = 1$ $S = \{8\}$

116. $\log_a(x^2 + x) - \log_a 5 = \log_a(x+1)$ $S = \{5\}$

117. $\log_2(x^2 + 1) - \log_2(2x-1) - 1 = 0$ $S = \{1; 3\}$

LIVELLO AVANZATO

118. $\mathrm{Log}(x-4) + \mathrm{Log}(3x-5) - \mathrm{Log}(1-2x) = 1$ $S = \{\emptyset\}$

119. $\log_3(x-5) + \log_3(x^2 - 4) - \log_3(x-2) = 2\log_3 x$ $S = \{\emptyset\}$

120. $\log^2{}_2 x + 5\log_2 x + 6 = 0$ $S = \left\{\frac{1}{8}; \frac{1}{4}\right\}$

121. $\mathrm{Log}^2(x-2) + \mathrm{Log}(x-2) - 2 = 0$ $S = \left\{\frac{201}{100}; 12\right\}$

122. $2\log^2{}_3 x - \log_3 x - 3 = 0$ $S = \left\{\frac{1}{3}; 3\sqrt{3}\right\}$

123. $2\mathrm{Log}^2 x - 5\mathrm{Log}x + 3 = 0$ $S = \{10; 10\sqrt{10}\}$

124. $2\ln(2x-3) - \ln(x-1) = \ln(x+1)$ $S = \left\{\frac{6+\sqrt{6}}{3}\right\}$

125. $\log_3^2 x - 3\log_3 x = -2$ $S = \{3; 9\}$

126. $\frac{\log_2(x-2)}{\log_2 x} = \frac{1}{2}$ $S = \{4\}$

127. $\frac{\log_2 x + 1}{\log_2 x - 1} + \frac{\log_2 x + 3}{\log_2 x - 3} = -2$ $S = \{1; 4\}$

128. $\log_3\left[\left(\frac{1}{2}\right)^{2x} + 3\left(\frac{1}{2}\right)^{x+1} + 2\right] = 1$ $S = \{1\}$

129. $3\ln\sqrt[3]{x+1} - \ln(x+1) = 0$ $S = \{x > -1\}$

130. $\log_3\left(2\cdot 3^x - 3^{2x} + 6\right)=1$ $S=\{1\}$

131. $\dfrac{\ln x-2}{\ln x+1}+\dfrac{\ln x+1}{\ln x}-\dfrac{2\ln x+5}{2\ln x+2}=0$ $S=\{e^2;\ \sqrt{e}\}$

132. $\log_3(x+3)-\log_9(2x-3)-1=0$ $S=\{6\}$

DISEQUAZIONI ESPONENZIALI

Risolvi le seguenti disequazioni:

LIVELLO BASE

133. $2^x>16$ $S=\{x>4\}$

134. $2^x>\dfrac{1}{8}$ $S=\{x>-3\}$

135. $2^x\le -\dfrac{1}{2}$ $S=\{\nexists x\in\mathcal{R}\}$

136. $2^x\ge 1$ $S=\{x\ge 0\}$

137. $\left(\dfrac{1}{2}\right)^x>4$ $S=\{x<-2\}$

138. $\left(\dfrac{2}{3}\right)^x\ge\dfrac{3}{2}$ $S=\{x\le -1\}$

139. $\left(2^{x-3}\right)^x\ge\dfrac{1}{4}$ $S=\{x\le 1\ \cup\ x\ge 2\}$

140. $\left(7^{x+1}\right)^x>49$ $S=\{x<-2\ \cup\ x>1\}$

141. $\left(3^{x-1}\right)^{x+1}>27$ $S=\{x<-2\ \cup\ x>2\}$

142. $5^x-125>0$ $S=\{x>3\}$

143. $3^x-\dfrac{1}{27}\le 0$ $S=\{x\le -3\}$

144. $\left(\frac{1}{3}\right)^{x+2} > 1$ $\qquad S = \{x < -2\}$

145. $2^x > 0$ $\qquad S = \{\forall x \in \Re\}$

146. $2^x > 3$ $\qquad S = \left\{x > \frac{\ln 3}{\ln 2}\right\}$

147. $4^x - 5 < 0$ $\qquad S = \left\{x < \frac{\ln 5}{\ln 4}\right\}$

148. $3^{x^2-2x} - 1 \geq 0$ $\qquad S = \{x \leq 0 \ \cup \ x \geq 2\}$

149. $\left(\frac{1}{5}\right)^{x^2+x-3} > \left(\frac{1}{5}\right)^{x-1}$ $\qquad S = \left\{-\sqrt{2} < x < \sqrt{2}\right\}$

150. $\left(\frac{1}{3}\right)^{x-1} + 2 \geq 0$ $\qquad S = \{\forall x \in \Re\}$

151. $5^{-x} - 25 \geq 0$ $\qquad S = \{x \leq -2\}$

152. $\left(\frac{2}{3}\right)^{2x} > \left(\frac{2}{3}\right)^{x+2}$ $\qquad S = \{x < 2\}$

153. $\left(\frac{3}{2}\right)^{x} - \frac{27}{8} < 0$ $\qquad S = \{x < 3\}$

154. $\left(\sqrt{2}\right)^{x} \geq 1$ $\qquad S = \{x \geq 0\}$

155. $\left(\frac{2}{5}\right)^{x^2} + 5 \geq 0$ $\qquad S = \{\forall x \in \Re\}$

156. $\left(\frac{1}{3}\right)^{x+1} - 5 \geq 0$ $\qquad S = \left\{x \leq -\frac{Log15}{Log3}\right\}$

157. $-4 - \left(\frac{5}{3}\right)^{x+1} \geq 0$ $\qquad S = \{\nexists x \in \Re\}$

158. $\left(\frac{1}{3}\right)^{3x+1} \leq 0$ $\qquad S = \{\nexists x \in \Re\}$

LIVELLO INTERMEDIO

159. $\frac{3^{x+1}\cdot 9^{x-1}}{\sqrt{27^x}} > \left(\frac{1}{3}\right)^x$ $\qquad S = \left\{x > \frac{2}{5}\right\}$

160. $2^{x-1} \le 3^{x+1}$ $\qquad S = \left\{x \ge \frac{Log2 + Log3}{Log2 - Log3}\right\}$

161. $5^{2x} + 4\cdot 5^x - 5 \ge 0$ $\qquad S = \{x \ge 0\}$

162. $\frac{2^{2x+1}\cdot\frac{1}{4}}{2\cdot\sqrt{2}} < \frac{1}{2}$ $\qquad S = \left\{x < \frac{3}{4}\right\}$

163. $9^{2x} - 8\cdot 9^x - 9 > 0$ $\qquad S = \{x > 1\}$

164. $3^{2x} - 3^x > 0$ $\qquad S = \{x > 0\}$

165. $5^{2x} + 2\cdot 5^x + 5 > 0$ $\qquad S = \{\forall x \in \mathbb{R}\}$

166. $\left(\frac{\sqrt{2}}{3}\right)^{x+3} \le \left(\frac{\sqrt{2}}{3}\right)^{2x+1}$ $\qquad S = \{x \le 2\}$

167. $\left(\frac{3}{5}\right)^{x-2} < \left(\frac{5}{3}\right)^{x+3}$ $\qquad S = \left\{x > -\frac{1}{2}\right\}$

168. $\left(\sqrt{2}\right)^{-x} < -2$ $\qquad S = \{\nexists x \in \mathbb{R}\}$

169. $2^{x+4}\cdot 3^{x+4} \ge 6^{2x-1}$ $\qquad S = \{x \le 5\}$

170. $10^x - 10^{-x} > 0$ $\qquad S = \{x > 0\}$

171. $4^x + 2^x - 6 > 0$ $\qquad S = \{x > 1\}$

172. $2^{2x+1} - 9\cdot 2^x + 4 < 0$ $\qquad S = \{-1 < x < 2\}$

173. $3^{2x} - 10\cdot 3^x + 9 < 0$ $\qquad S = \{0 < x < 2\}$

174. $2^x + 2^{x-1} + 2^{x-2} < 7$ $\qquad S = \{x < 2\}$

175. $\frac{2^{x+1}}{8^{2x}} \le \frac{1}{2^{x^2+5}}$ $\qquad S = \{2 \le x \le 3\}$

176. $27\cdot\sqrt[3]{9^{x-1}}\le\sqrt{3^x}$ $\qquad S=\{x\le -14\}$

177. $\dfrac{81^{x+1}\cdot 9^x}{27^{x-3}}<1$ $\qquad S=\left\{x<-\dfrac{13}{3}\right\}$

178. $12\left(\dfrac{4}{9}\right)^x-35\left(\dfrac{2}{3}\right)^x+18>0$ $\qquad S=\{x<-2 \quad \cup \quad x>1\}$

179. $\left(\dfrac{2}{3}\right)^{x+1}+\left(\dfrac{2}{3}\right)^{x-1}+\left(\dfrac{2}{3}\right)^x>\dfrac{19}{6}$ $\qquad S=\{x<0\}$

180. $3^{2x}-4\cdot 3^x+3>0$ $\qquad S=\{x<0 \quad \cup \quad x>1\}$

LIVELLO AVANZATO

181. $\dfrac{3^x}{3^x-2}>3$ $\qquad S=\left\{\dfrac{\ln 2}{\ln 3}<x<1\right\}$

182. $\dfrac{\left(\dfrac{1}{3}\right)^{2x-3}}{3^x-1}\ge 0$ $\qquad S=\{x>0\}$

183. $\dfrac{5^{2x}-5^x}{5^{2x}+5^x}\ge 0$ $\qquad S=\{x\ge 0\}$

184. $\sqrt{3^{x-1}}>25\cdot 5^{2x}$ $\qquad S=\left\{x<\dfrac{4\ln 5+\ln 3}{\ln 3-4\ln 5}\right\}$

185. $2^x-2^{-x}>2$ $\qquad S=\{x>\log_2(1+\sqrt{2})\}$

186. $2^{x+3}-2^{x-1}<3^x+3^{x+2}$ $\qquad S=\left\{x>\dfrac{Log3-Log4}{Log3-Log2}\right\}$

187. $\left|2^x-4\right|<4$ $\qquad S=\{x<3\}$

188. $\left|2\cdot 9^x-1\right|>5$ $\qquad S=\left\{x>\dfrac{1}{2}\right\}$

189. $2^{x+2}+2^x+2^{x+1}\ge 14$ $\qquad S=\{x\ge 1\}$

190. $\left|5^x-7\right|\le 2$ $\qquad S=\left\{1\le x\le\dfrac{Log9}{Log5}\right\}$

DISEQUAZIONI LOGARITMICHE

Risolvi le seguenti disequazioni:

LIVELLO BASE

191. $\log_3 7 \le \log_3 x$ $\qquad S = \{x \ge 7\}$

192. $\log_3\left(x^2+4\right) > 0$ $\qquad S = \{\forall x \in \Re\}$

193. $\mathrm{Log}(x-1) < \mathrm{Log}\,\frac{x}{2}$ $\qquad S = \{1 < x < 2\}$

194. $\log_{\frac{4}{5}}(3x+7) > 1$ $\qquad S = \left\{-\frac{7}{3} < x < -\frac{31}{15}\right\}$

195. $\log_2 x < 3$ $\qquad S = \{0 < x < 8\}$

196. $\log_{\frac{1}{2}} x < 3$ $\qquad S = \left\{x > \frac{1}{8}\right\}$

197. $3\log_2 x \ge \frac{1}{2}$ $\qquad S = \{x \ge \sqrt[6]{2}\}$

198. $\log_{\frac{1}{2}}(3x-5) > 2$ $\qquad S = \left\{\frac{5}{3} < x < \frac{7}{4}\right\}$

199. $\log_2 x > 2$ $\qquad S = \{x > 4\}$

200. $\log_{\frac{1}{2}}\left(x^2-x\right) > \log_{\frac{1}{2}}\left(x^2+1\right)$ $\qquad S = \{-1 < x < 0 \quad \cup \quad x > 1\}$

201. $\log_3\left(x^2-3x-3\right) > 0$ $\qquad S = \{x < -1 \quad \cup \quad x > 4\}$

202. $\mathrm{Log}(3x-1) - \mathrm{Log}(7-x) \ge 0$ $\qquad S = \{2 \le x < 7\}$

203. $\mathrm{Log}\left(7x-x^2\right) - 1 < 0$ $\qquad S = \{0 < x < 2 \quad \cup \quad 5 < x < 7\}$

204. $\log_5(x-2) > \log_5\left(2x-x^2\right)$ $\qquad S = \{\nexists x \in \Re\}$

205. $\ln\left(x^2-1\right) > 1$ $\qquad S = \left\{x < -\sqrt{1+e} \quad \cup \quad x > \sqrt{1+e}\right\}$

206. $\log_{\frac{4}{5}}\left(2x-x^2\right) < \log_{\frac{4}{5}}(1-2x)$ $\qquad S = \left\{2-\sqrt{3} < x < \frac{1}{2}\right\}$

207. $\log_{\frac{1}{2}}(3x+5)-1\geq 0$ $\qquad S=\left\{-\frac{5}{3}<x\leq -\frac{3}{2}\right\}$

208. $\ln(x-2)>\ln(5-x)$ $\qquad S=\left\{\frac{7}{2}<x<5\right\}$

209. $\log_{\frac{3}{4}}(1-x^2)\leq 0$ $\qquad S=\{x=0\}$

210. $\ln(x^2-4)\leq \ln(25-x^2)$ $\qquad S=\left\{-\sqrt{\frac{29}{2}}\leq x<-2 \quad \cup \quad 2<x\leq \sqrt{\frac{29}{2}}\right\}$

211. $\log_{\frac{5}{4}}(5x+1)-2>0$ $\qquad S=\left\{x>\frac{9}{80}\right\}$

LIVELLO INTERMEDIO

212. $\log_2(x^2-1)-\log_2(x+1)>2$ $\qquad S=\{x>5\}$

213. $\ln x^2-2\ln(x-1)>\ln 9$ $\qquad S=\left\{1<x<\frac{3}{2}\right\}$

214. $\log_{\frac{1}{2}}(x^2-3x+2)-\log_{\frac{1}{2}}(x+1)\leq \log_{\frac{1}{2}}(x+1)$ $\qquad S=\left\{-1<x\leq \frac{1}{5}\right\}$

215. $\log_5(x-2)+\log_5(x+2)-\log_5(2x^2-11x+5)<0$ $\qquad S=\left\{x>\frac{11+\sqrt{85}}{2}\right\}$

216. $\ln(x^2-4)>\ln(5x-4)$ $\qquad S=\{x>5\}$

217. $\log_{\frac{1}{2}}(x^2-x)>\log_{\frac{1}{2}}6$ $\qquad S=\{-2<x<0 \quad \cup \quad 1<x<3\}$

218. $\log_2\frac{x+3}{x}>1$ $\qquad S=\{0<x<3\}$

219. $\log_{\frac{1}{5}}(3x-2)>-2$ $\qquad S=\left\{\frac{2}{3}<x<9\right\}$

220. $4\log_{\frac{1}{2}}x+1>0$ $\qquad S=\left\{0<x<\sqrt[4]{2}\right\}$

221. $\ln(x^2-1)-\ln(x+3)<\ln x$ $\qquad S=\{x>1\}$

222. $\log_2(2x+8-x^2) > \log_2(6-x)+\log_2 x$ $\qquad S=\{0<x<2\}$

223. $\log\left(2+\frac{1}{x}\right)-\log\left(2-\frac{1}{x}\right) < \log(2x+1)-\log(1-2x)$ $\qquad S=\{\nexists x \in \mathbb{R}\}$

224. $2\mathrm{Log}x-\mathrm{Log}(x-1) > 2\mathrm{Log}2$ $\qquad S=\{1<x<2 \ \cup \ x>2\}$

225. $\log_{\frac{2}{5}} \frac{x+1}{x-1} \geq 0$ $\qquad S=\{x<-1\}$

226. $\frac{1}{2}\log_{\frac{1}{3}}(25-x)-\log_{\frac{1}{3}}(x-5)<0$ $\qquad S=\{5<x<9\}$

227. $\log_3(\log_2(x-1))<0$ $\qquad S=\{2<x<3\}$

228. $\log_3\left(\log_{\frac{1}{3}}(3x+1)\right)>0$ $\qquad S=\left\{-\frac{1}{3}<x<-\frac{2}{9}\right\}$

229. $\mathrm{Log}(\mathrm{Log}(x-1))>0$ $\qquad S=\{x>11\}$

230. $\log_2(\log_2(x-3)) \geq 0$ $\qquad S=\{x \geq 5\}$

LIVELLO AVANZATO

231. $2\log^2{}_3 x-\log_3 x-3 \geq 0$ $\qquad S=\left\{0<x\leq\frac{1}{3} \ \cup \ x\geq 3\sqrt{3}\right\}$

232. $\log^2{}_2 x+5\log_2 x+6>0$ $\qquad S=\left\{0<x<\frac{1}{8} \ \cup \ x>\frac{1}{4}\right\}$

233. $\frac{\mathrm{Log}x}{2+\mathrm{Log}x}-\frac{1}{2}\mathrm{Log}x<1$ $\qquad S=\left\{x>\frac{1}{100}\right\}$

234. $\log_3^2(x+3)-\log_3(x+3)-2>0$ $\qquad S=\left\{-3<x<-\frac{8}{3} \ \cup \ x>6\right\}$

235. $\mathrm{Log}(x^2-3)^2 > \mathrm{Log}4x^2$ $\qquad S=\left\{\begin{matrix} x<-3 \ \cup \ -1<x<0 \ \cup \\ 0<x<1 \ \cup \ x>3 \end{matrix}\right\}$

236. $\ln\left(-\frac{1}{x}\right)<\ln\frac{1-x}{x^2+x+1}$ $\qquad S=\left\{x<-\frac{1}{2}\right\}$

237. $\log^2_{\frac{1}{2}} x-2\log_{\frac{1}{2}} x>0$ $\qquad S=\left\{0<x<\frac{1}{4} \ \cup \ x>1\right\}$

238. $\dfrac{\log^2_{\frac{1}{2}} x - 5\log_{\frac{1}{2}} x + 6}{\log^2_{\frac{1}{2}} x + 3\log_{\frac{1}{2}} x - 4} < 0$ $\qquad S = \left\{\frac{1}{8} < x < \frac{1}{4} \ \cup \ \frac{1}{2} < x < 16\right\}$

239. $2(\log_3 x)^2 - 5\log_3 x + 2 < 0$ $\qquad S = \{\sqrt{3} < x < 9\}$

240. $\ln\sqrt{x^2 - 5x} > \ln\sqrt{-x-3}$ $\qquad S = \{x < -3\}$

241. $\ln x + \ln(-x^2+3x-2) > \ln(-x^3+3x^2)$ $\qquad S = \{\nexists x \in \mathcal{R}\}$