97. Determine an expression for: $\sum_{n=1}^{5} \log_a n$

A. $\log_a 5$ B. $\log_a 6$ C. $\log_a 15$ D. $\log_a 120$

98. At which of the following points is the relation $\log(y-x)+\log(y+x)=\log 9$ not defined?

A. $(0,\ 3)$ B. $(-4,\ 5)$ C. $(4,\ -5)$ D. $(4,\ 5)$

99. Solve algebraically: $\log_2(2-2x)+\log_2(1-x)=5$

100. A biologist determines that a particular type of bacteria grows continuously according to the formula $P=P_0e^{kt}$. Determine the value of the continuous growth rate if the population of the bacteria increases from 500 to 1500 in 8 days.

JUN 2002

101. Determine the logarithmic form of $a=b^c$.

A. $\log_a b=c$ B. $\log_a c=b$ C. $\log_c a=b$ D. $\log_b a=c$

102. Solve: $\left(\frac{1}{4}\right)^{1-2x}=8^{x-3}$

A. -7 B. $\frac{11}{7}$ C. $\frac{7}{4}$ D. no solution

103. A recent earthquake in Turkey measured 7.2 on the Richter scale. In 1960, the earthquake in Morocco measured 5.8. How many times as intense was the recent Turkey earthquake compared to the Moroccan earthquake?

A. 1.24 B. 1.4 C. 17.43 D. 25.12

104. If the graph of $y = \log_a x$ goes through the point (1024, 5), determine a.

A. 4 B. 4.31 C. 10 D. 204.8

105. A sample of water contains 200 g of pollutants. Each time the sample is passed through a filter, 20% of its pollutants are removed. Determine an example that gives the number of grams of pollutants still in the water after it passes through five filters.

A. $200(0.8)^4$ B. $200(1.2)^4$ C. $200(0.8)^5$ D. $200(1.2)^5$

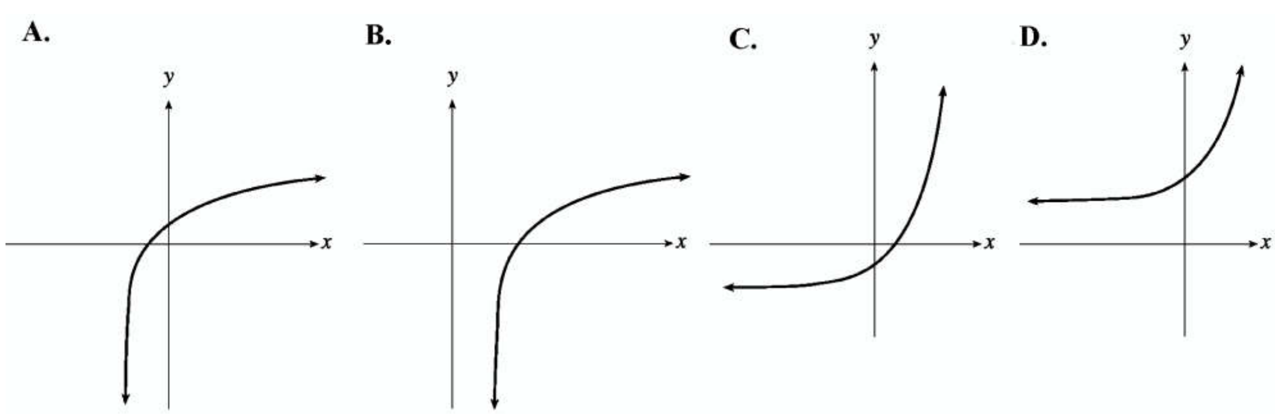
106. If $\log_a x = 3$ and $\log_a y = 4$, evaluate $\left(\log_a \frac{1}{xy}\right)^2$.

A. $\frac{1}{49}$ B. 1 C. 14 D. 49

107. Simplify: $e^{\ln a}$

A. a B. e^a C. $\ln a$ D. ae

108. Which graph best represents the function $y = \log_2(x - 2)$?



109. Solve algebraically: $\log_2 x + \log_2(x-7) = 3$

AUG 2002

110. Change $\log_4 c = x$ to exponential form.

A. $x^4 = c$ B. $4^x = c$ C. $4^c = x$ D. $c^x = 4$

111. Determine the domain of $y = 2\log_4(x-1)+5$.

A. $x > 1$ B. $x > 4$ C. $x > 5$ D. all real numbers

112. Solve: $25^{x+3} = 125^{2x-1}$

A. $-\frac{16}{3}$ B. 1 C. $\frac{11}{8}$ D. $\frac{9}{4}$

113. Solve: $\log_4(x^2+1) - \log_4 6 = \log_4 5$

A. $\sqrt{10}$ B. $\pm\sqrt{10}$ C. $\sqrt{29}$ D. $\pm\sqrt{29}$

114. Determine the x-intercept of $y = \log_2(x+4)+1$.

A. -3 B. -3.5 C. -3.9 D. -4

115. Max invests \$5 000 at an interest rate of 6% per annum, compounded monthly. Which expression represents the amount of Max's investment after t years?

A. $5000(1.06)^{12t}$ B. $5000(1.005)^{12t}$ C. $5000(1.06)^{t}$ D. $5000(1.005)^{\frac{t}{12}}$

116. Which expression is equivalent to $\log(m^2n)^3$?

A. $6\log m + 3\log n$ B. $6\log m + \log n$ C. $(2\log m + \log n)^3$ D. $\log 3m^2 + \log 3n$

117. Simplify: $\ln e^{x^5}$

A. 5 B. $5x$ C. x^5 D. $\frac{x}{5}$

118. A radioactive substance is produced from nuclear fallout. If 250 g of this substance decays to 150 g in 30 years, what is the half-life of this substance? (Solve algebraically using logarithms.) (Answer accurate to at least 2 decimal places.)

SPECS 2002

119. Evaluate: $\log_{5.3} 210$

A. 0.31 B. 1.60 C. 2.31 D. 3.21

120. Solve: $27^{x+2} = \left(\frac{1}{3}\right)^{3-6x}$

A. $-\frac{1}{3}$ B. $\frac{1}{7}$ C. $\frac{5}{3}$ D. 3

JAN 2003

121. Determine an equation of the asymptote of $f(x) = 2^{x-1} + 3$.

A. $y = 2$ B. $y = -2$ C. $y = 3$ D. $y = -3$

122. The pH scale measures the acidity (0-7) or alkalinity (7-14) of a solution. It is a logarithmic scale in base 10. Thus, a pH of 12 is 10 times more alkaline than a pH of 11. If bleach has a pH of 13, how many times more alkaline is it than blood which has a pH of 8?

A. 1.625 B. 5 C. 50 D. 100000

123. If $\log_3(m+n)=2,\ (m+n)>0$, express m in terms of n.

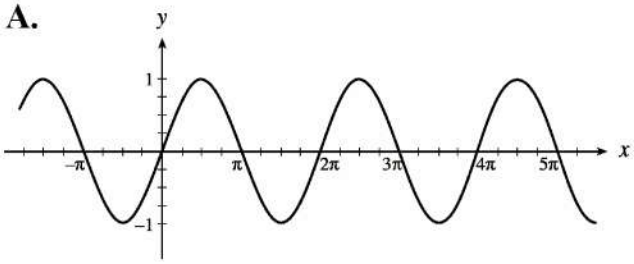
A. $m=9-n$ B. $m=6-n$ C. $m=\dfrac{9}{n}$ D. $m=\dfrac{6}{n}$

124. A radioactive substance decays continuously according to the formula $N=Ce^{kt}$, where N is the final amount, C is the initial amount, k is the time in years. If 50 grams of the substance decays to 20 grams in 10 years, determine the value of k.

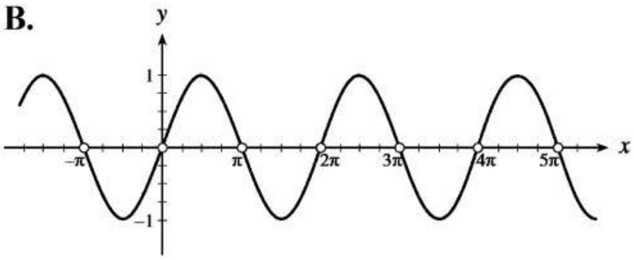
A. -0.0916 B. -0.0398 C. 0.0610 D. 0.0916

125. Which graph best represents the function $\log y=\log\sin x$?

A.



B.



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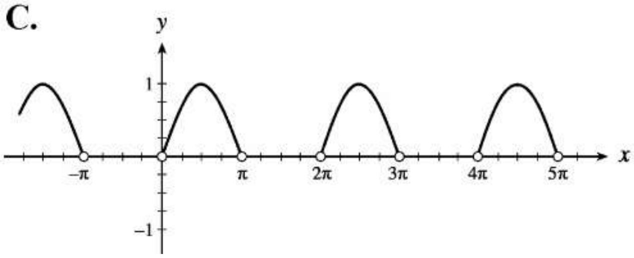
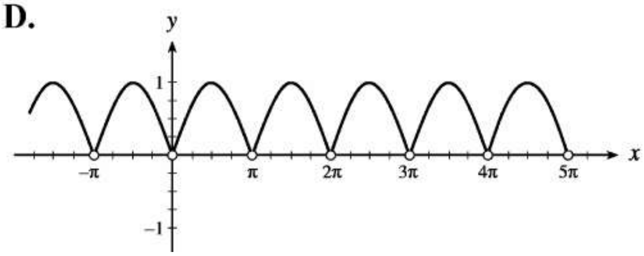


D.



126. Solve algebraically: $2\log(3-x)=\log 4+\log(6-x)$

JUN 2003

127. Determine the domain of the function $y=\log(3x-5)$.

A. $x>-\dfrac{5}{3}$ B. $x>-\dfrac{3}{5}$ C. $x>\dfrac{3}{5}$ D. $x>\dfrac{5}{3}$

128. Express as a single logarithm: $\log a - 2\log b - \log c$

A. $\log \frac{ac}{2b}$ B. $\log \frac{ac}{b^2}$ C. $\log \frac{a}{2bc}$ D. $\log \frac{a}{b^2 c}$

129. Solve for x: $8^{x-1} = \left(\frac{1}{16}\right)^{5-x}$

A. $-\frac{19}{4}$ B. -3 C. $\frac{23}{7}$ D. 17

130. An earthquake off the coast of Alaska measured 6.4 on the Richter scale. Another earthquake near Japan was 50 times as intense. What was the Richter scale reading for the earthquake near Japan?

A. 7.1 B. 7.9 C. 8.1 D. 10.9

131. Which expression gives the amount that an investment of P dollars will grow to after 4 years if it is compounded semi-annually at a rate of 5% per annum?

A. $P(1.05)^4$ B. $P(1.025)^4$ C. $P(1.05)^8$ D. $P(1.025)^8$

132. Given that $y_1 = \log_a 0.4$ and $y_2 = \log_a 4$, where $0 < a < 1$, which of the following must be true?

A. $y_1 < y_2$ B. $y_1 > y_2$ C. $0.4 < y_1 < 4$ D. $0.4 < y_2 < 4$

133. If 200g of a substance decays to 17g in 28 days, determine the half-life of this substance. (Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.)

JAN 2004

134. Evaluate: $\log_3 59.2$

A. 0.27 B. 1.30 C. 3.71 D. 19.73

135. Determine the domain of $y = \log_a(-x)$.

A. $x < 0$ B. $x > 0$ C. $x \le 0$ D. $x \ge 0$

136. Express as a single logarithm: $\log A - 3\log B + \log C$

A. $\log \frac{AC}{3B}$ B. $\log \frac{AC}{B^3}$ C. $\log \frac{A}{B^3C}$ D. $\log(A - 3B + C)$

137. If the point $(2,9)$ is on the graph of $y = a^x$, what point must be on the graph of $y = \log_a x$?

A. $\left(2, \frac{1}{9}\right)$ B. $(2,9)$ C. $(9,-2)$ D. $(9,2)$

138. Solve: $\log_2(3 - 2x) - \log_2(2 - x) = \log_2 3$

A. -2 B. $\frac{1}{2}$ C. 3 D. no solution

139. The number of insects in a colony can triple in 7 weeks. After 50 weeks, how many times greater will the number of insects be than after 20 weeks?

A. 81 B. 110.87 C. 243 D. 2.06×10^{14}

140. A radioactive substance decays from 600 g to 105 g in twelve days. Determine the half-life, in days, for this substance.

A. 4.77 B. 5.27 C. 7.43 D. 30.17

141. Solve algebraically using logarithms: $2^x = 5^{x+1}$ (Answer accurate to at least 2 decimal places.)

JUN 2004

142. Determine the domain of $f(x) = \log_7(x+6)+12$.

A. $x > 6$ B. $x > -6$ C. $x > 12$ D. $x > -12$

143. Express $\log_5 30$ using logarithms in base 4.

A. $\log_4 30 - \log_4 5$ B. $\dfrac{\log_4 5}{\log_4 30}$ C. $\dfrac{\log_4 30}{\log_4 5}$ D. $\dfrac{\log_{30} 4}{\log_5 4}$

144. Solve: $\left(\frac{1}{9}\right)^x = 27^{2-x}$

A. -6 B. $\frac{6}{5}$ C. 2 D. 6

145. Which expression is equivalent to $\log \dfrac{x}{2y^3}$?

A. $\log x - \log 2 + 3\log y$ B. $\log x - 3\log 2 + 3\log y$
C. $\log x - \log 2 - 3\log y$ D. $\log x - 3\log 2 - 3\log y$

146. Solve: $\log_2 x + \log_2(x-1) = 3$

A. 2.37 B. 3 C. 3.37 D. 3.5

147. The formula $A = P(1.09)^t$ is an example of exponential growth with base 1.09. Determine an equivalent continuous growth formula using base e, $A = Pe^{kt}$.

A. $A = Pe^{0.086t}$ B. $A = Pe^{1.086t}$ C. $A = Pe^{0.86t}$ D. $A = Pe^{1.86t}$

148. Determine an exponential function in the form $y = 3^{x-h}+k$ with y-intercept 5 and asymptote $y = -4$

A. $y = 3^{x-4}+5$ B. $y = 3^{x-2}-4$ C. $y = 3^{x-5}-4$ D. $y = 3^{x+2}-4$

AUG 2005

149. Express as a single logarithm: $\log m - \log n - 3\log k$

A. $\log \frac{m}{nk^3}$ B. $\log \frac{m}{3nk}$ C. $\log \frac{mk^3}{n}$ D. $\log \frac{3mk}{n}$

150. Determine the domain of the function $y = \log(x-5)$.

A. $x \geq 5$ B. $x > 5$ C. $x \leq 5$ D. $x < 5$

151. Simplify: $9\log_{27} x - 4\log_9 x$

A. $\log_3 x$ B. $\log_9 x$ C. $\log_{27} x$ D. $\frac{3}{4}\log_3 x$

152. A particular type of bacteria multiplies 5-fold every 30 minutes. Initially there are 100 bacteria. Determine an expression for the number of bacteria after k minutes.

A. $\frac{100(5)^k}{30}$ B. $100(5)^{30k}$ C. $100(5)^{\frac{30}{k}}$ D. $100(5)^{\frac{k}{30}}$

153. Given $f(x) = 2^x + 5$, determine $f^{-1}(x)$, the inverse of $f(x)$.

A. $f^{-1}(x) = 5 + \log_2 x$ B. $f^{-1}(x) = -5 + \log_2 x$

C. $f^{-1}(x) = \log_2(x+5)$ D. $f^{-1}(x) = \log_2(x-5)$

154. Solve algebraically: $2\log_3(x+4) - \log_3(-x) = 2$

AUG 2006

155. Change $\log_a p = t$ to exponential form.

A. $p^t = a$ B. $a^t = p$ C. $a^p = t$ D. $t^p = a$

156. Solve: $\log_5(3x) - \log_5(x-3) = 2$

A. -6 B. $-\frac{1}{2}$ C. $\frac{75}{22}$ D. 11

157. A population grows continously according to the formula $P = P_0e^{kt}$, where P is the final population in t years, P_0 is the initial population and k is the continuous growth rate. What will be the population in 7 years if the initial population is 25 000 and the continuous growth rate is 1.2%?

A. 27191 B. 57909 C. 177113 D. 197312

158. A radioactive substance has a half-life of 17 days. How many days will it take for 300 g of this substance to decay to 95 g? (Solve algebraically using logarithms. Answer accurate to at least 2 decimal places.)

SAMPLE 2008

159. Determine the domain of $y = \log(x+1)$.

A. $x < 1$ B. $x > 1$ C. $x < -1$ D. $x > -1$

160. Determine an equivalent expression for $\log \frac{100a^2}{\sqrt{b}}$.

A. $2\log 100a - \frac{1}{2}\log b$ B. $2 + 2\log a - \frac{1}{2}\log b$

C. $4\log a - \frac{1}{2}\log b$ D. $100 + 2\log a - \frac{1}{2}\log b$

161. Evaluate: $\log_{\sqrt{7}} 7^3$

A. $\frac{2}{3}$ B. $\frac{3}{2}$ C. 6 D. 9

162. As an iceberg melts during the summer, it loses 3% of its mass every 5 days. This iceberg reduces to 40% of its original mass after t days. Which equation could be used to determine the value of t?

A. $40 = 100(0.97)^{\frac{t}{5}}$ B. $40 = 100(0.97)^{\frac{5}{t}}$ C. $40 = 100(1.03)^{\frac{t}{5}}$ D. $40 = 100(1.03)^{\frac{5}{t}}$

163. Solve: $\log_2(\log_9 x) = -1$

A. $\frac{1}{81}$ B. $\frac{1}{3}$ C. 3 D. 81

164. Solve: $5^{x+1} = 2\left(3^{2x}\right)$

A. $x = \frac{-\log 5}{1 - 2\log 6}$ B. $x = \frac{-\log 5}{\log 5 - 2\log 6}$ C. $x = \frac{\log 2 - \log 5}{1 - 2\log 3}$ D. $x = \frac{\log 2 - \log 5}{\log 5 - 2\log 3}$

165. Change to logarithmic form: $a^3 = b$

A. $3 = \log_a b$ B. $3 = \log_b a$ C. $b = \log_a 3$ D. $a = \log_b 3$

166. A population grows continously according to the formula $P = P_0 e^{kt}$, where P is the final population at the end of t years, P_0 is the initial population and k is the annual growth rate. Determine the population (millions) at the end of 8 years if the initial population is 15 million and the annual growth rate is 4%.

A. 20.66 B. 124.90 C. 179.02 D. 367.99

167. Determine the magnitude of an earthquake that is half as intense as an earthquake of magnitude 8.0 on the Richter scale.

A. 4.0 B. 5.0 C. 7.7 D. 8.3