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## Logarithms

**1.** If $\ln x = 4$, then $x = ?$

**A.** 1

**B.** $\frac{4}{e}$

**C.** $4e$

**D.** $e$

**E.** $e^4$

**2.** What integer does $5(\log_3 9)$ equal?

**A.** 3
**B.** 10
**C.** 15
**D.** 135
**E.** 405

**3.** What is the value of $\log_3 \sqrt{27}$ ?

**A.** $\frac{1}{2}$

**B.** $\frac{3}{2}$

**C.** $\sqrt{3}$

**D.** 2

**E.** 3

**4.** What is the value of the positive real number $x$ such that $\log_x \frac{1}{16} = -4$ ?

**A.** 2
**B.** 4
**C.** 8
**D.** 16
**E.** 64

**5.** What real value of $x$ satisfies the equation $\log_4 16^2 = 2x$?

**A.** 2
**B.** 3
**C.** 6
**D.** 16
**E.** 64

**6.** The total amount of a certain substance present in a laboratory experiment is given by the formula $A = A_0\left(2^{\frac{h}{4}}\right)$, where $A$ is the total amount of the substance $h$ hours after an initial amount $(A_0)$ of the substance began accumulating. Which of the following expressions gives the number of hours it will take an initial amount of 20 grams of this substance to accumulate to 80 grams?

**A.** $4$
**B.** $16$
**C.** $\log_2 40$
**D.** $4\log_2 4$
**E.** $4\log_8 80$

**7.** Which of the following values is the $x$-coordinate of the point in the standard $(x, y)$ coordinate plane where the graph of the line $y = 8$ intersects the graph of the function $y = \ln(x - 3) + 4$ ?

**A.** $8$
**B.** $3e - 4$
**C.** $e^4 + 3$
**D.** $\ln 5 + 3$
**E.** $\ln 7 + 5$

**8.** Which of the following is equivalent to the expression $1024 = 4^5$ ?

**A.** $5^4 = 1024$
**B.** $\log_4 5 = 1024$
**C.** $\log_4 1024 = 5$
**D.** $\log_5 4 = 1024$
**E.** $\log_5 1024 = 4$

**9.** If $\log_a x = q$ and $\log_a y = r$, then $\log_a (xy)^3 = ?$

**A.** $q + r$
**B.** $3(q + r)$
**C.** $9qr$
**D.** $3qr$
**E.** $qr$

**10.** The value of $\log_6 6^{\frac{14}{3}}$ is between which of the following pairs of consecutive integers?

**A.** 0 and 1
**B.** 2 and 3
**C.** 3 and 4
**D.** 4 and 5
**E.** 6 and 7

**11.** For what value of $x$, if any, is the statement $\log_2(x+3) = 4$ true?

**A.** $-13$
**B.** $-1$
**C.** $3$
**D.** $13$
**E.** There is no such value of $x$.

**12.** For what value of $x$, if any, is the statement $\log_{x+1}(x+3) = 2$ true?

**A.** 0
**B.** 1
**C.** 2
**D.** 4
**E.** There is no such value of $x$

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