1) Solve for \(a\):
\[
\log_7(\!a - 4\!) = 2
\]
A) 18  B) 49  C) 53  D) 104  E) NOTA

2) Solve for \(b\):
\[
2 \cdot 4^{b-2} = 32
\]
A) 2  B) 4  C) 8  D) 16  E) NOTA

3) What is the unit’s digit of \(2^{2004} + 3^{2004} - 5^{2004}\)?
A) 0  B) 2  C) 5  D) 8  E) NOTA

4) Which of the following is the same representation of the function \(h(x) = 16^{\sqrt{x}},\ x > 0\)?
I. \(h(x) = 4^x\)  II. \(h(x) = 8 \cdot 2^{\sqrt{x}}\)  III. \(h(x) = 8^{\sqrt{x}}\)  IV. \(h(x) = 4^{2\sqrt{x}}\)
A) IV. only  B) I. & IV. only  C) II. & III. only  D) All of these  E) NOTA

5) Find the sum of all values of \(a\) that satisfy the given equation:
\[
\begin{align*}
\log_{10} \left( \frac{a}{a-1} \right) = \frac{1}{2} &= \log_{10} a - \log_{10} \left( \frac{1}{2} \right),\ a > 0
\end{align*}
\]
A) 0  B) 1  C) 2  D) No solution  E) NOTA

6) Given: \(9^x - 2 \cdot 3^{x+1} - 7 = 0\)
The solution for \(x\) to the equation above can be represented as a decimal. What is the hundredths digit of the decimal representation?
A) 0  B) 1  C) 6  D) 7  E) NOTA

7) Evaluate:
\[
\sqrt{182} + \sqrt{182} + \sqrt{182} + \cdots
\]
A) 13  B) \(\sqrt{182}\)  C) 14  D) \(\infty\)  E) NOTA
8) The number of bacteria in a certain sample is monitored by a scientist. He notes that after one week there are 6531 bacteria and after two weeks there are 8634. If the amount of bacteria present follows a logarithmic pattern \( y = a + b \ln x \) where \( y \) is the amount of bacteria after \( x \) weeks, how many whole bacteria are in the sample after three weeks?

A) 9864  
B) 10351  
C) 10734  
D) 13769  
E) NOTA

9) Evaluate: \( \sum_{n=1}^{4} \log_2 n \)

A) 0  
B) 1  
C) 2  
D) \( \log_2 10 \)  
E) NOTA

10) If \( a = \log_{10} x \), \( b = \log_{10} y \), and \( c = \log_{10} z \), where \( x, y, \) and \( z \) are all greater than 0, then which of the following is equal to \( 2a - b + \frac{3c}{2} \)?

A) \( \log_{10} \left( \frac{3 \cdot x \cdot z}{y} \right) \)  
B) \( 2 \log_{10} \left( \frac{x \cdot \sqrt[3]{z^3}}{\sqrt{y^2}} \right) \)  
C) \( \log_{10} \left( \frac{x^2 \cdot \sqrt[3]{y^2}}{z} \right) \)  
D) \( 3 \log_{10} \left( \frac{x \cdot z}{y} \right) \)  
E) NOTA

11) Simplify: \( 2^{\log_4 2^{100}} \)

A) \( 2^{25} \)  
B) \( 2^{50} \)  
C) \( 2^{100} \)  
D) \( 2^{200} \)  
E) NOTA

12) Given: \( \log_{10} A = \frac{5}{2} \), \( \log_{10} B = \frac{9}{2} \), \( \log_{10} C = \frac{-3}{2} \)

What is the value of \( \log_{10} \left( \frac{A \cdot B^2}{C^3} \right) \)?

A) \(-15\)  
B) \(7\)  
C) \(15\)  
D) \(16\)  
E) NOTA

13) The graphs of \( y = x^2 \) and \( y = 2^x \) intersect in how many places?

A) 0  
B) 1  
C) 2  
D) 3  
E) NOTA

14) Which of the following function(s) has or have inverses that are functions for a domain of all real numbers?

I. \( y = x^2 - 1 \)  
II. \( 2y = x + 3 \)  
III. \( y = x^3 - 6 \)  
IV. \( y = x^3 - 6x \)

A) II. only  
B) I. & IV. only  
C) II. & III. only  
D) All of these  
E) NOTA
15) Simplify the given expression in terms of \( x \):
\[
\left(-1024 \cdot \frac{1}{x^2}\right)^{3/5}, \ x \neq 0
\]
A) \( \frac{1}{16x^{3/5}} \)  
B) \( \frac{1}{32x^2} \)  
C) \( -\frac{1}{4x^{-3/5}} \)  
D) Undefined  
E) NOTA

16) Given: \( f(x) = \log_2(x! + 8), x \in \mathbb{N} \)
Find: \( f^{-1}(5) \)
A) 4  
B) 5  
C) 7  
D) Cannot be determined  
E) NOTA

17) The BANK OF WYOMING compounds its money continuously according to the formula: \( y = Pe^{rt} \). Ms. Fish decides to put $1,525.00 in this bank and after 1 year, she discovers that she now has $1,642.13. How long will it take for her money to double in value? (Round your answer to the nearest tenth of a year)
A) 1.9  
B) 6.7  
C) 9.4  
D) 13.2  
E) NOTA

18) The number \( q \) written in scientific notation is given by: \( q = 6.63 \times 10^3 \).
In this form let \( A \) be the characteristic of \( q \) and \( B \) be the mantissa of \( q \). Using this information, solve for \( x \) in the given equation: (Round your answer to the nearest hundredth)
\[
4^{(4x)} = 3^{(Bx+1)}
\]
A) \(-0.35\)  
B) \(0.19\)  
C) \(2.41\)  
D) \(2.82\)  
E) NOTA

19) What is the coefficient of the \( a^{12}b^{12} \) term of the given expansion?
\[
\left(\frac{2}{3} a^3 + \frac{1}{2} b^2\right)^{10}
\]
A) \(\frac{1}{324}\)  
B) \(\frac{5}{18}\)  
C) \(\frac{35}{54}\)  
D) \(\frac{28}{27}\)  
E) NOTA

20) What is the domain of \( y = \log_4(x^2 - 2) \)?
A) \( x \in \mathbb{R} \)  
B) \( x > 0 \)  
C) \( x < -2 \) or \( x > 2 \)  
D) \( x \leq -\sqrt{2} \) or \( x \geq \sqrt{2} \)  
E) NOTA
21) Find an expression in terms of \( n \) for: \( \prod_{x=3}^{n} \log_{x} (x+1) \quad n \in N \)

A) \( \log_{n} (n+1) \)  
B) \( \log_{3} n \)  
C) \( \log_{3} (n+1) \)  
D) \( \log_{n} 4 \)  
E) NOTA

22) Using the fact that \( i = \sqrt{-1} \), simplify the given expression:
\[
\left[ (\frac{1}{i^3})^5 + (-i)^{-1} \right]^4
\]

A) \(-4\)  
B) \(0\)  
C) \(1\)  
D) \(16\)  
E) NOTA

23) Given: \( \log_{x^2} y = \frac{1}{9} \quad x > 0, y > 0 \)
Find: \( \log_{\sqrt[3]{x}} x^3 \)

A) \(9\)  
B) \(\frac{27}{2}\)  
C) \(18\)  
D) \(27\)  
E) NOTA

24) Given: \( 50^a 125^b 8^c = 1000 \)
Find: \( a + b + c \)

A) \(2\)  
B) \(3\)  
C) \(4\)  
D) \(6\)  
E) NOTA

25) Find the sum of all values of \( y \) that satisfy the given equation:
\( \log_{y} (y+12) = 2 \quad y > 0 \)

A) \(0\)  
B) \(1\)  
C) \(4\)  
D) \(12\)  
E) NOTA

26) Evaluate: \( \sum_{z=1}^{\infty} \frac{1}{2^z} \)

A) \(\frac{1}{2}\)  
B) \(1\)  
C) \(2\)  
D) \(\frac{7}{4}\)  
E) NOTA

27) Solve for \( x \): \( \log_7 (\log_5 (\log_2 x)) = 0 \)

A) \(2\)  
B) \(4\)  
C) \(16\)  
D) \(32\)  
E) NOTA
28) Given: \( x = a^r, y = a^{2r}, \) and \( z = 2x \) for \( a, x, y, \) and \( z \) all greater than 1. How many of the following are true?

I. \( \log_a a = r \)
II. \( y = x^2 \)
III. \( 2y = z^2 \)
IV. \( \log_a \left( \frac{z}{2} \right) = r \)

A) 1  B) 2  C) 3  D) 4  E) NOTA

29) Given: \( a \# b = \begin{cases} a^b & \text{if } a < b \\ \left( \frac{a - 5}{3} \right) \# (b + 1) & \text{if } a \geq b \end{cases} \)

What is the value of \( 146 \# 1 \)?
A) 16  B) 27  C) 81  D) 146  E) NOTA

30) How many digits are in \( 2004^{2004} \)?
A) 6617  B) 6618  C) 8016  D) 8017  E) NOTA