Where applicable, "E) NOTA" indicates that none of the above answers is correct.

1. What is the square root of the sum of the first 2015 positive odd integers?

A) $\sqrt{2015}$ B) $\sqrt{2014}$ C) 2015   D) 2014   E) NOTA

2. Evaluate $[\log_{abc}(a^c)][1 + \log_a b + \log_a c]$ for $a = 617$ $b = 233$ $c = 340$.

A) 617   B) 233   C) 340   D) 54289   E) NOTA

3. A geometric sequence is one where the ratio between each two consecutive terms is constant. The fifth term of a geometric sequence is 5! and the 6th term is 6!. What is the 4th term of the sequence?

A) 20   B) 24   C) $\frac{24}{5}$ D) $\frac{10}{3}$ E) NOTA

4. Find the sum of the solutions for e^x in the equation $2e^x + e^{-x} = 3$.

A) 0   B) $\frac{1}{2}$ C) $\frac{3}{2}$ D) 1   E) NOTA

5. What is the value of the expression

$$\frac{1}{\log_2 100!} + \frac{1}{\log_3 100!} + \frac{1}{\log_4 100!} + \cdots + \frac{1}{\log_{100} 100!}?$$

A) 0.01   B) 0.1   C) 1   D) 2   E) NOTA

6. The expression $\sqrt[3]{\frac{17\sqrt{7}+45}{4}}$ can be written in the form $\frac{a+\sqrt{b}}{c}$ where a, b, c are positive integers and b is not divisible by the square of an integer. What is $a + b + c$?

A) 8   B) 12   C) 18   D) 20   E) NOTA

7. Find the sum of the solutions of the following equation:
$$27^x - 9^{x-1} - 3^{x+1} + \frac{1}{3} = 0$$

A) $\frac{1}{3}$ B) -2 C) $\frac{1}{2}$ D) $-\frac{3}{2}$ E) NOTA

8. What is the y intercept of the graph produced by the following parametric equations?

$$x = \ln t \qquad y = e^{2t}$$

A) $(0,1)$ 　　　　　B) $(0,e)$ 　　　　　C) $(0,e^2)$ 　　　　　D) $(0,\ln t)$ 　　　　　E) NOTA

9. The expression $\dfrac{2015}{2015+\dfrac{2015}{2015+\dfrac{2015}{2015+\dfrac{2015}{2015+\cdots}}}}$ can be written in the form $\dfrac{\sqrt{ab}-a}{2}$, where $a \; and \; b$ are positive integers. What is $a - b$?

A) 2 　　　　　B) 4 　　　　　C) 4034 　　　　　D) 6045 　　　　　E) NOTA

10. If $g\left(\sqrt{\dfrac{x-1}{x+1}}\right) = 3x$ find $g(3)$.

A) $\dfrac{\sqrt{2}}{2}$ 　　　　　B) $-\dfrac{5}{4}$ 　　　　　C) 9 　　　　　D) $-\dfrac{15}{4}$ 　　　　　E) NOTA

11. Suppose that $\log_2(\log_3(\log_5(\log_7 M))) = 11$. How many different positive prime numbers are factors of M?

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

12. How many points do $y = \begin{cases} 10^{2016} - x^2 & if \; x < 2 \\ \sqrt{x} + 10^{2016} & if \; x \geq 2 \end{cases}$ AND $y = 10^{-x} + 10^{2016}$ have in common?

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

13. For how many different positive integers n does $\sqrt{n}$ differ from 5 by less than 1?
A) 8 　　　　　B) 17 　　　　　C) 19 　　　　　D) 20 　　　　　E) NOTA

14. Suppose that $3 = k(2)^r$ and $15 = k(4)^r$. What is r?

A) $-\log_2 5$ 　　　　　B) $\log_5 2$ 　　　　　C) $\log 5$ 　　　　　D) $\log_2 5$ 　　　　　E) NOTA

15. If $x = \left(1 + \dfrac{1}{n}\right)^n$ and $y = \left(1 + \dfrac{1}{n}\right)^{n+1}$, express y^x as a power of x.

A) $x^{1+\frac{1}{n}}$ 　　　　　B) x^{x+1} 　　　　　C) x^y 　　　　　D) x^{xy} 　　　　　E) NOTA

16. If $L > 1$, then $\sqrt[3]{L\sqrt[3]{L\sqrt[3]{L}}} = ?$

A) $L^{\frac{1}{27}}$　　　　　B) $L^{\frac{1}{9}}$　　　　　C) $L^{\frac{1}{3}}$　　　　　D) $L^{\frac{13}{27}}$　　　　　E) NOTA

17. Solve $x^{1+\log_{\frac{1}{2}} x} > \frac{x}{4}$

A) $\frac{1}{2} < x < 2$　　　B) $2^{-\sqrt{2}} < x < 2^{\sqrt{2}}$　　C) $\frac{\sqrt{2}}{2} < x < \sqrt{2}$　　D) $\sqrt{2}^{-\sqrt{2}} < x < \sqrt{2}^{\sqrt{2}}$　　E) NOTA

18. What percent of the domain the function $f(x) = \frac{\sqrt{9-x^2}}{\sqrt[4]{9-|2x+5|}}$ consists of positive numbers?

A) 35　　　　　B) 40　　　　　C) 50　　　　　D) 55　　　　　E) NOTA

19. The pH of any solution can be calculated by the formula $pH = -\log[H]^+$ where $[H]^+$ is the hydrogen ion concentration of the solution. If John's normal blood pH decreases from 7.4 to 7.2 during exercise, what percent of increase is his hydrogen ion concentration?

A) $10^{2.2} - 10^2$　　B) $10^2 - 10^{-1.8}$　　C) $10^2 - 10^{-0.2}$　　D) $10^2 - 10^{0.2}$　　E) NOTA

20. If x is a primitive cube root of one (this means that $x^3 = 1$ but $x \neq 1$,) compute the value of

$$\log\left(x^{2015} + \frac{1}{x^{2015}} + x^{2016} + \frac{1}{x^{2016}}\right)$$

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

21. The equation $2^{x^2} = 16^{2x-3}$ has two solutions. What is their sum?

A) -2　　　　　B) 0　　　　　C) 6　　　　　D) 8　　　　　E) NOTA

22. If x is a number satisfying the equation $\sqrt[3]{x+9} - \sqrt[3]{x-9} = 3$ then x^2 is:

A) 56　　　　　B) 76　　　　　C) 80　　　　　D) 84　　　　　E) NOTA

23. Find the value of $\displaystyle\sum_{n=1}^{\infty}\left(\dfrac{1}{\log_2 4^{2^n}}\right)$.

A) 1   B) $\dfrac{3}{4}$ C) $\dfrac{1}{2}$ D) $\dfrac{1}{4}$ E) NOTA

24. Evaluate $\sqrt[3]{26+15\sqrt{3}}+\sqrt[3]{26-15\sqrt{3}}$

A) 4   B) 2   C) 8   D) 7   E) NOTA

25. Find the value of $-\sqrt{5-\sqrt{5-\sqrt{5-\sqrt{5-\dots}}}}$.

A) $\dfrac{1+\sqrt{21}}{2}$ B) $\dfrac{-1+\sqrt{21}}{2}$ C) $\dfrac{1-\sqrt{21}}{2}$ D) $\dfrac{-1-\sqrt{21}}{2}$ E) NOTA

26. Let $a=\log_{12} 27$. Write $\log_6 16$ in terms of a.

A) $\dfrac{4(3+a)}{(3-a)}$ B) $\dfrac{2(3+a)}{(3+a)}$ C) $\dfrac{(3-a)}{(3+a)}$ D) $\dfrac{4(3-a)}{(3+a)}$ E) NOTA

27. Find the equation of the vertical asymptote for the graph of $y=-1-5\log_2(-2x+3)$?

     A) $x=-3$ B) $x=3$ C) $x=-1$ D) $x=1$ E) NOTA

28. Solve for x given $\begin{vmatrix} x & e^{\ln 6} & 2e^{\ln 1} \\ e^{2\ln 3-3\ln 2} & 0 & e^{-\ln 5} \\ e^{\ln 5} & 5^{\ln e^2} & e^{\pi i} \end{vmatrix}=0$.

A) $\dfrac{69}{5}$ B) $\dfrac{-57}{5}$ C) $\dfrac{62}{5}$ D) 14   E) NOTA

29. The solutions to the equation $\sin(\ln x)+2\cos(3\ln x)\sin(2\ln x)=0$ can be written in the form $e^{\frac{a\pi}{b}}$. Find the value of ab of the smallest such x, with $x>1$ that satisfies the equation.

A) 3   B) 5   C) 6   D) 10   E) NOTA

30. Compute the smallest possible integer a for which $\sqrt{a + \sqrt{a + \cdots}} - \dfrac{1}{a + \frac{1}{a + \cdots}} > 7.$

A) 11   B) 23   C) 37   D) 43   E) NOTA