For all questions, answer choice "E) NOTA" means none of the above answers is correct.

1. For $x=\ln 5$, which of the following is true?

A) $x<0$ B) $0<x<1$ C) $1<x<2$ D) $2<x<3$ E) NOTA

2. Rank the expressions from least to greatest:

I) $\sqrt[6]{4\sqrt{15}}$ II) $\sqrt[6]{15\sqrt{4}}$ III) $\sqrt{2\sqrt[6]{15}}$ IV) $\sqrt[6]{5\sqrt{12}}$

A) I, III, IV, II B) I, III, II, IV C) III, I, IV, II D) III, I, II, IV E) NOTA

3. If $f(x)=x^3-2x^2-24x$, find the sum of all real values w such that $f(w^3+1)=0$.

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

4. Suppose $\frac{2}{A}=\sqrt{\frac{9B}{A}-2B^2}$, where defined, for real numbers A and B. If $A=MB^N$, where M and N are real numbers, find the sum of all possible values of $M+N$.

A) $1/2$ B) -3 C) $9/2$ D) $5/2$ E) NOTA

5. Evaluate $\left(x+\frac{1}{x}\right)^2$ when $x=\frac{\sqrt{42}}{7}$.

A) $85/42$ B) $169/42$ C) $127/42$ D) 4 E) NOTA

6. Find the sum of the real solutions to the equation $\log_2|x^2+2x-3|-\log_2|x+3|=3$.

A) 2 B) -4 C) 9 D) 0 E) NOTA

7. An equilateral triangle encloses an area of $\frac{1}{2}\log b^4$, and a square with side length equal to that of the triangle encloses an area of $\log a^3$, where $a,b>0$. Evaluate $\log_a b$.

A) $3/2$ B) $3\sqrt{3}/8$ C) $3/4$ D) $2\sqrt{3}/3$ E) NOTA

8. Find the sum of the y-values of the points of intersection of the graphs of $y=\log_6 x^2$ and $y=\log_6(x+6)$.

A) 2 B) $\log_6 12$ C) 1 D) $\log_6 9$ E) NOTA

9. Find the sum of the real solutions to the equation $4\sqrt[3]{x^4}=5\sqrt[3]{x^2}+9$.

A) 2 B) $21/8$ C) $27/8$ D) 4 E) NOTA

10. Evaluate: $\sum_{n=2}^{2011}\frac{1}{\log_n 2011!}$

A) 2011! B) 2011^2 C) 2011 D) 1 E) NOTA

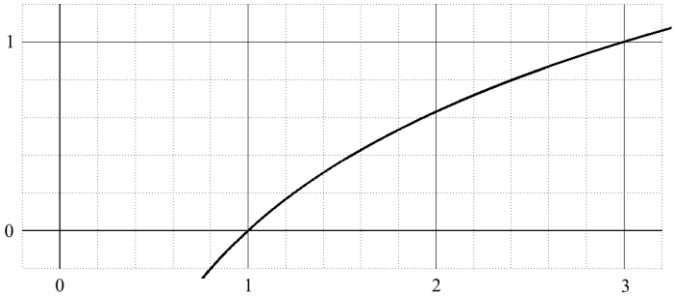
11. How many of the following statements are true for all appropriate values of b, x, and y?

I) $\log_b\left(y\sqrt{x}\right)=(\log_b y)\left(\frac{1}{2}\log_b x\right)$ II) $2(\log_b y+\log_b x)=\log_b\left(x^2y^2\right)$

III) $\log_b x-\log_b y=\frac{\log_b x}{\log_b y}$ IV) $4\log_b x-3\log_b y=\log_b\left(\frac{x^4}{y^{-3}}\right)$

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

12. Given that $5\approx 3^{1.5}$ and the graph below of $y=\log_3 x$, which is the closest value to $5^{4/9}$?



A) 1.5 B) 1.9 C) 2.1 D) 2.5 E) 2.7

13. Given $\log 3=.4771$ and $\log 5=.6990$, evaluate $\log 6$.

A) 0.58805 B) 0.7323 C) 0.7781 D) 0.9542 E) NOTA

14. Find the real value of x that satisfies $\sum_{i=3}^{\infty}\left(4^{x}\right)^{i-1}=\frac{1}{2}$.

A) $-1/6$ B) $-1/3$ C) $-1/4$ D) $-1/2$ E) NOTA

15. If $\Phi(m,n)=\log_n m$, $\Psi(m,n)=m^n$, and $\Omega(m,n)=\sqrt[m]{n}$, find the value of the expression $\Psi\left(\Phi\left(\Omega(2,262144),2\right),\Phi(8,27)\right)$.

A) 3 B) 4 C) 5 D) 6 E) NOTA

16. Find the base-10 sum of the digits of the base-5 representation of the base-10 sum $\sum_{k=1}^{5}5^{k+\log_5 k}$.

A) 8 B) 9 C) 10 D) 11 E) NOTA

17. If $a=\log_8 16$ and $b=\log_{16}5$, which of the following is equivalent to $\frac{3ab}{3ab+1}$?

A) $\log_6 5$ B) $\log 5$ C) $\log_8 5$ D) $\log_5 8$ E) NOTA

18. If $\log(\log A)+\log B=\log(\log C)$, where $A,B,C>1$, find A in terms of B and C.

A) $A=\sqrt[C]{B}$ B) $A=10^{\log_B C}$ C) $A=\sqrt[B]{C}$ D) $A=10^{\log_C B}$ E) NOTA

19. Find the value of x if $y^{\log_x y}=81^2$ and $x^{\log_y x}=3$.

A) 3 B) 9 C) 27 D) 81 E) NOTA

20. How many integer solutions satisfy the inequality $\ln\left(\log_4\left(x^2-5\right)\right)<0$?

A) 2 B) 3 C) 4 D) 5 E) NOTA

21. How many integer solutions satisfy the inequality $\frac{1}{\log_2 x}+\frac{1}{\log_3 x}+\frac{1}{\log_4 x}>2$?

A) 2 B) 3 C) 4 D) 5 E) NOTA

22. If $2^{4a-b}=\log_7 2401$ and $\log_4(98a+138b)=5$, find the value of the product ab.

A) 12 B) 10 C) 8 D) 6 E) NOTA

23. When rationalized and simplified, the expression $\frac{4}{\sqrt[3]{3}+\sqrt[3]{5}}$ can be written in the form $\sqrt[3]{A}+\sqrt[3]{B}-\sqrt[3]{C}$, where A, B, and C are positive real numbers. Evaluate $\frac{AB}{C}$.

A) $192/5$ B) $27/5$ C) $15/8$ D) $5/12$ E) NOTA

24. Find the product of the solutions to the equation $\sqrt[3]{x^2}+15=8\sqrt[3]{x}$

A) 152 B) 1125 C) 2250 D) 3375 E) NOTA

25. The value of $\prod_{k=1}^{2011}\log_{k+1}(k+3)$ is closest to which of the following numbers?

A) 25 B) 50 C) 75 D) 100 E) NOTA

26. If the graph of the function $y=\ln(f(x))$, where $f(x)>0$, is a line, then the graph of the function $y=f(x)$ must be of what type?

A) linear B) exponential C) logarithmic D) sinusoidal E) NOTA

27. If the sum $\sum_{k=2}^{2011}\frac{1}{\sqrt{k}+\sqrt{k-1}}$ can be written in the form $\sqrt{A}-\sqrt{B}$, where A and B are positive integers, find the value of $A+B$.

A) 2010 B) 2011 C) 2012 D) 2013 E) NOTA

28. Find the domain of the graph represented by the equation $(x+2)^{2y}+x^3=27$.

A) $(-2,3)$ B) $(-2,0)\cup(0,3)$ C) $(-2,-1)\cup(-1,3)$ D) $(-3,2)$ E) NOTA

29. Solve for x: $\left(\sqrt[4]{\sqrt[3]{25}}\right)\left(\sqrt{\sqrt{\sqrt{5}}}\right)\left(\sqrt[4]{\sqrt[6]{5}}\right)\left(\sqrt[3]{\sqrt{125}}\right)=5^x$

A) $5/6$ B) $3/4$ C) $7/8$ D) $11/12$ E) NOTA

30. Let $f(x)=\log x$, and let $f^n(x)$ represent the concatenations of $f(x)$ n times (ex. $f^5(x)=f\left(f\left(f\left(f\left(f(x)\right)\right)\right)\right)$). If the domain of $f^n(x)$ includes the interval $(2159112778,\infty)$, find the largest possible integral value of n.

A) 9 B) 8 C) 6 D) 3 E) NOTA