For this test, let $i = \sqrt{-1}$. Select (E) NOTA *if none of the above answers are correct. Good luck!*

1. Evaluate $\sqrt{-6} \cdot \sqrt{-6}$.
   (A) $6i$ (B) 6 (C) -6 (D) $-6i$ (E) NOTA

2. Simplify the expression $2010 \cdot (2010^{49})^{41}$
   (A) 2010! (B) 2010^{91} (C) 2010^{2000} (D) 2010^{2010} (E) NOTA

3. Evaluate the infinite sum $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots$.
   (A) 1 (B) 2 (C) 3 (D) 4 (E) NOTA

4. If $f(x) = \frac{1}{2}x + 5$, then determine $f^{-1}(x)$.
   (A) $f^{-1}(x) = \frac{1}{2}x - \frac{5}{2}$ (B) $f^{-1}(x) = x - 5$ (C) $f^{-1}(x) = 2x - 5$ (D) $f^{-1}(x) = 2x - 10$ (E) NOTA

5. If $f(x) = 3x^2$ and $g(x) = 4x - 5$, find $f(g(2))$.
   (A) 9 (B) 24 (C) 43 (D) 81 (E) NOTA

6. How many solutions does the equation $\dfrac{25(x-1)(x-2)(x-3)(x-4)}{(x-5)(x-3)(x-1)} = \dfrac{x(x-1)(x-2)(x-3)(x-4)}{(x-5)(x-3)(x-1)}$ have?
   (A) 0 (B) 1 (C) 2 (D) 3 (E) NOTA

7. Two horses 900 miles apart are running toward each other at the same speed of 30 miles per hour. A superbee starts at one horse and flies back and forth at 75 miles per hour between the horses as they run towards each other. How many miles will the bee have flown when the horses collide? Assume it does not take extra time for the bee to turn around.
   (A) 225 (B) 1125 (C) 1500 (D) 2250 (E) NOTA

8. What is the sum of all possible x given that $x^{\log x} = \dfrac{x^3}{100}$?
   (A) 2 (B) 10 (C) 47 (D) 100 (E) NOTA

9. Evaluate $(1 - i)^4 \cdot (2 - 2i)^2$.
   (A) -32 (B) $-32i$ (C) $32i$ (D) 32 (E) NOTA

10. Evaluate the expression $\dfrac{(\log_{11} 625)(\log_{25} 512)(\log_8 1331)}{(\log_2(\log_{64}(\log_2 256)))}$.
    (A) -18 (B) -9 (C) 9 (D) 18 (E) NOTA

11. Evaluate $(49^{\frac{1}{4}} + 25^{\frac{1}{4}})^4 \cdot (49^{\frac{1}{4}} - 25^{\frac{1}{4}})^4$.
    (A) 1 (B) 11 (C) 16 (D) 671 (E) NOTA

12. If the two roots of $2x^2 - 4x - 1 = 0$ are α and β, what is $\alpha^2 + \beta^2$?
    (A) 3 (B) 4 (C) 5 (D) 6 (E) NOTA

13. Determine the value of $\dfrac{1}{xy} + \dfrac{1}{yz} + \dfrac{1}{xz}$ given that $x + y + z = 9$ and $xyz = 3$.
    (A) $\frac{1}{6}$ (B) 3 (C) 6 (D) 54 (E) NOTA

14. If $A=\begin{pmatrix} 5 & 6 \\ 3 & 4 \end{pmatrix}^{-1}$, what is the determinant of A?

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

15. If x and y are real numbers where $x^2+y^2=1$, then determine the maximum value of $(x+y)^2$.

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

16. Three pipes P, Q, and R fill a pool at their own constant rates. If only pipes Q and R are open, it takes one and half hours to fill up the pool. If only pipes P and R are open, it takes one hour and twenty minutes to fill up the pool. Finally, if all three pipes are open, it takes one hour to fill up the entire pool. How many hours will it take for pipes P and Q to fill up the pool?

(A) $\frac{7}{12}$ (B) 1 (C) $\frac{12}{7}$ (D) 2 (E) NOTA

17. Find the value of $x+y$ given $\begin{bmatrix} 5 & -1 \\ 3 & -2 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix}=\begin{bmatrix} 1 \\ -12 \end{bmatrix}$.

(A) 11 (B) 2 (C) 9 (D) 7 (E) NOTA

18. Solve for x where $9^{x-1}-3^{x-1}-2=0$.

(A) $x=2$, $x=-1$ (B) $x=1-\log_3 2$ (C) $x=\log_3 6$ (D) $x=-2$, $x=1$ (E) NOTA

19. What is the sum of the solutions to the equation $\log_2(x-5)+\log_2(x+2)=3$?

(A) 2 (B) 3 (C) 5 (D) 6 (E) NOTA

20. The probability that I will go to Taco Bell on Monday is 0.3 . The probability that I will go to Taco Bell on Tuesday is 0.6. The probability that I will go to Taco Bell on Wednesday is 0.2. Assuming that the probabilities of going to Taco Bell on these three days are independent of each other, what is the probability that I go to Taco Bell only once out of these three days?

(A) $\frac{9}{250}$ (B) $\frac{28}{125}$ (C) $\frac{61}{125}$ (D) $\frac{16}{25}$ (E) NOTA

21. Evaluate $\sqrt{(3-\sqrt{7})^2}-\left|1-\sqrt{7}\right|$.

(A) -2 (B) $2\sqrt{7}-2$ (C) $2\sqrt{7}-4$ (D) 4 (E) NOTA

22. Determine the eccentricity of the conic section $9x^2+4y^2-6x-24y+36=0$.

(A) $\frac{\sqrt{13}}{4}$ (B) $\frac{\sqrt{13}}{2}$ (C) $\frac{\sqrt{5}}{3}$ (D) $\frac{\sqrt{97}}{2}$ (E) NOTA

23. Evaluate $\dfrac{x+\sqrt{x^2-1}}{x-\sqrt{x^2-1}}-\dfrac{x-\sqrt{x^2-1}}{x+\sqrt{x^2-1}}$ where $x=\dfrac{5}{\sqrt{5}}$.

(A) $2\sqrt{5}$ (B) $4\sqrt{5}$ (C) $8\sqrt{5}$ (D) $16\sqrt{5}$ (E) NOTA

24. Determine the value of $\left||4-3i|+12i^{2011}\right|$.

(A) -13 (B) -7 (C) 7 (D) 13 (E) NOTA

25. Determine the value of $x^4+\dfrac{1}{x^4}$ given that $x^2-3x+1=0$.

(A) 47 (B) 49 (C) 79 (D) 81 (E) NOTA

26. Let x be the 31st triangular number and y be the 7th prime number. Compute the value of $x + y$.

(A) 472 (B) 496 (C) 503 (D) 513 (E) NOTA

27. Evaluate $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \cdots + \frac{1}{49 \cdot 50}$

(A) 0.90 (B) 0.92 (C) 0.95 (D) 0.96 (E) NOTA

28. A palindrome is an integer that reads the same backwards and forwards (*ex. 1331*). What is the sum of all positive four digit palindromes?

(A) 11,000 (B) 99,999 (C) 459,000 (D) 495,000 (E) NOTA

29. If $a = \sqrt{2 + \sqrt{3}}$, $b = \sqrt{2 + \sqrt{2 + \sqrt{3}}}$, $c = \sqrt{2 + \sqrt{2 + \sqrt{2 + \sqrt{3}}}}$, and $d = \sqrt{2 - \sqrt{2 + \sqrt{2 + \sqrt{3}}}}$, then find the value of $a \cdot b \cdot c \cdot d$

(A) $4 + \sqrt{3}$ (B) $12 + 2\sqrt{3}$ (C) $-\frac{1}{3}$ (D) 1 (E) NOTA

30. The Kang function, denoted as $k(x) = x^5 + ax^4 + bx + c$, has some strange properties. Both the arithmetic mean and the product of the zeroes of $k(x)$ are equal to the value of $k(1)$. If the y-intercept of the graph $y = k(x)$ is 1, compute the value of $a \cdot b \cdot c$.

(A) -30 (B) -40 (C) 30 (D) 56 (E) NOTA