

Note: For this test $i = \sqrt{-1}$ and
 NOTA is defined as "None of the Above Answers is Correct".

- 1) A square is inscribed in a unit circle with a radius of one. If another circle is inscribed inside the square, then what is the circumference of the smaller circle?

A) π B) $\frac{1}{\sqrt{2}}\pi$ C) $\pi\sqrt{2}$ D) π^2 E) NOTA

- 2) A farmer owns a rectangular field that is 4 miles long and 2 miles wide. He wants to build a house within the field that, combined with its yard, will take up an area of 0.5 square miles. How many square miles will be remaining?

A) 5.5 B) 6.5 C) 7.5 D) 8.5 E) NOTA

- 3) Evaluate: $i^{45} + i^{35} - \sqrt{-121} + (4 + 3i)^2 - (2 - i)(4 + i)$

A) $7 - 4i$ B) $2 + 17i$ C) $5 + 11i$ D) $-2 + 15i$ E) NOTA

- 4) Evaluate: $\sum_{k=5}^{50} (k^2 + 3)$

A) 43033 B) 43063 C) 43075 D) 51039 E) NOTA

- 5) Solve for x in the following equation: $4x^2 + 9 = 0$, where $x \in \mathbb{R}$.

A) $\frac{3}{2}, -\frac{3}{2}$ B) $\frac{9}{4}$ C) $\frac{3}{2}, -\frac{3}{2}$ D) $\frac{\pm 9i}{4}$ E) NOTA

- 6) If x represents the number of positive integral factors of 2002, then find the largest prime number that is less than x .

A) 7 B) 11 C) 13 D) 17 E) NOTA

- 7) What is the area of a right triangle that has sides with lengths of $(x+4)$, $(x+19)$, and $(x+34)$?
- A) 1350 B) 1675 C) 5625 D) 6275 E) NOTA
- 8) What is the remainder when $2005x^5 - 2004x^2 + 2003x - 2002$ is divided by $x-3$?
- A) -513262 B) -465172 C) -477190 D) 473186 E) NOTA
- 9) Mary can scrub the entire kitchen floor in two hours. It takes Anne three hours to complete the same job. How long does it take Oscar to scrub the floor if the three of them working together can complete the job in half an hour?
- A) $\frac{1}{2}$ hour B) $\frac{6}{7}$ hour C) 1 hour D) $\frac{5}{2}$ hours E) NOTA
- 10) Find the midpoint of a line segment containing end points of $(-4, 7)$ & $(-8, -3)$.
- A) $(2, 2)$ B) $(2, 5)$ C) $(-6, 5)$ D) $(-6, 2)$ E) NOTA
- 11) Find the sum, in base 6, of $2003_{\text{Four}} + 2004_{\text{Five}}$
- A) 1441_{six} B) 4001_{six} C) 333_{six} D) 225_{six} E) NOTA
- 12) Solve the system of equations and find $(x + y + z)$:
- $$\begin{aligned} 3x + y - z &= 12 \\ 4x - y + 2z &= 13 \\ -10x + 4y - 3z &= -14 \end{aligned}$$
- A) 10 B) 11 C) 14 D) inconsistent E) NOTA
- 13) For a polynomial equation of the second degree, the sum of the roots is -4 , the product of the roots is -0.5 , find the sum of the reciprocals of the roots:
- A) -8 B) -1 C) $\frac{1}{8}$ D) $\frac{3}{4}$ E) NOTA

14) If the singles digit in $2003^{227} = \text{now}$, and the hundreds digit in $1980^{725} = \text{then}$,
Find: **then - now**

- A) -7 B) 0 C) 1 D) 9 E) NOTA

15) Gorrest Fump invests \$ 365 in a math team mutual fund. The fund has an annual interest rate of $\pi\%$, compounded quarterly. What is Gorrest Fump's profit, to the nearest cent, if he invests for 30 years?

- A) \$ 933.27 B) \$ 725.35 C) \$ 568.27 D) \$ 227.22 E) NOTA

16) Find the number of positive integral factors of 5544.

- A) 12 B) 24 C) 48 D) 96 E) NOTA

17) How many rational roots are in the equation: $x^4 - x^3 - 5x^2 + 3x + 6 = 0$

- A) 0 B) 1 C) 2 D) 4 E) NOTA

18) Evaluate: $\sqrt{6 + \sqrt{6 + \sqrt{6 + \dots}}}$

- A) -2.5 B) $\sqrt{6}$ C) 2.5 D) $\frac{49}{20}$ E) NOTA

19) The discriminant of a quadratic function is -35. The function has but one y-intercept and its value is $\log\left(\frac{1}{3}\right)$. What direction does this quadratic function open if it must be one of the following (down, up, right, or left)?

- A) down B) up C) right D) left E) NOTA

20) Solve for x: $\ln(\log_2(\log_3(\log_4 x))) = 0$

- A) 0 B) 81 C) 19683 D) 262144 E) NOTA

21) Find the distance between $(3, 1, -8)$ and $(-2, 7, -3)$ in space.

- A) $\sqrt{62}$ B) $\sqrt{86}$ C) $\sqrt{114}$ D) $\sqrt{182}$ E) NOTA

- 22) The area of an ellipse is the same as the area of a square with sides of length 8. If the minor axis is always two-thirds the length of the major axis in the ellipse, then find the focal length of the ellipse. Round the answer to the nearest hundredth. The focal length is the distance between the foci points.

A) 8.22 B) 8.23 C) 8.24 D) 8.25 E) NOTA

23) $z \log_x AB^4 - \log_x B^z + 2 = z \log_x A + z \log_z z + 3z \log_x B$.

Find the value of z .

A) $\log_x A$ B) $\log_x B$ C) $4 \log_x B$ D) $-2z \log_x B$ E) NOTA

- 24) Find the sum of all values that make this statement true: $|x + 5| = |2x - 7|$.

A) $\frac{27}{2}$ B) $\frac{35}{3}$ C) $\frac{38}{3}$ D) 12 E) NOTA

- 25) The eccentricity of a conic section is $\frac{3}{5}$. The distance between the foci points is 24. Find the length of the minor axis of this conic section.

A) 32 B) 40 C) 42 D) 48 E) NOTA

- 26) How many digits are in the product of $(2002)^{2003}(2004)^{2005}$?

A) 13228 B) 13234 C) 30458 D) 30471 E) NOTA

- 27) Which of the following is equivalent to: $\sqrt{27x^3y^2} \sqrt[3]{x^5y^{13}z}$. For $x, y, \& z > 0$.

A) $x^3y^5 \sqrt[6]{27xy^2z^2}$ B) $3x^2y^5 \sqrt[6]{27x^2y^2z^2}$ C) $3x^3y^5 \sqrt[6]{27xy^2z^2}$

D) $3x^3y^4 \sqrt[6]{3x^2y^3z^2}$ E) NOTA

28) The dot product of two vectors is found by multiplying the corresponding values and adding of all the parts as follows: $(a, b, c) \bullet (d, e, f) = ad + be + cf$.

If $(y, 5, -3) \bullet (4, 6, x) = 41$ and $(-5, y, 6) \bullet (x, 4, 2) = 25$, then find the sum of $x + y$.

- A) 0 B) 1 C) 3 D) 5 E) NOTA

29) Let A = the highest number of possible positive real roots of $f(x)$ and Let B = the highest number of possible negative real roots of $f(x)$, according to Descartes' Rule of Signs. Find $(A + B)^3$ for the following $f(x)$:

$$f(x) = x^{2005} + 1966x^{2002} - 819x^{2001} - 1122x^{1998} + 1025x^{1991} - 227x^{1980} - 725x^{1966} + 1$$

- A) 216 B) 729 C) 1000 D) 1728 E) NOTA

30) Let the discriminant of a quadratic equation equal 16. The quadratic can be put in the form $ax^2 + bx + c = 0$, where $a, b, \& c$ are real numbers. Which of the following choices has to be correct?

- A) The quadratic has 2 negative real roots B) The quadratic has a positive y intercept
C) The quadratic opens upward D) The quadratic has rational roots
E) NOTA