Choose the correct answer and bubble it on your answer sheet. If none of the answers are correct, then choose E) NOTA.

1. What is the remainder when $(9x^{16} – 2x^{13} + 4x^9 – 6x^2 + 2x –1)$ is divided by $(x+1)$?

A. 6 B. 3 C. –1 D. –2 E. NOTA

2. Given $xy = 42$ and $(x-y)^2 = 169$, what is $x^2 + y^2$?

A. 85 B. 211 C. 253 D. 265 E. NOTA

3. Given: $4^{3x-5} = 9^{2x+3}$, find x to the nearest tenth.

A. 656.8 B. 8 C. –57.3 D. –57.4 E. NOTA

4. Find the constant term in the expansion of $\left(3x^3 + \frac{4}{x^2}\right)^{10}$.

A. 83607552 B. 69672960 C. 39191040 D. 331776 E. NOTA

5. Find the minimum point of the parabola: $y = x^2 - 6x + 4$

A. (5, 3) B. (5, -3) C. (3, 5) D. (3, -5) E. NOTA

6. Assume Z varies jointly with the cube of Y and inversely with the square of X. If Y=3 when X=4 and Z=9, find the positive value of X (to the nearest tenth) when Y=6 and Z=10.

A. 115.2 B. 10.7 C. 11.9 D. 1.3 E. NOTA

7. Find :

$$\begin{vmatrix} 2 & -5 & 3 \\ -9 & 1 & 7 \\ 0 & -1 & 10 \end{vmatrix}$$

A. -417 B. -389 C. 429 D. 457 E. NOTA

8. Find the probability that, when you randomly draw out two playing cards from a deck of 52 without replacement, both cards are face cards.

A. 9/169 B. 11/221 C. 20/221 D. 33/676 E. NOTA

9. Solve: $\sqrt{210+\sqrt{210+\sqrt{210+\ldots}}}$

A. 14 B. 15 C. 224 D. 225 E. NOTA

10. Give the value of the sum of the roots plus the product of the roots minus the sum of the reciprocal of the roots for the following equation:

$$f(x) = 2x^3 - 8x^2 + 18x + 12$$

A. –7/2 B. –1/2 C. 17/2 D. 23/2 E. NOTA

11. What is the 4^{th} term in the expansion of $(3a + 2b)^9$.

A. $489888a^7b^2$ B. $314928a^6b^3$ C. $314928a^7b^2$ D. $489888a^6b^3$ E. NOTA

12. Give the sum of a convergent (infinite) geometric sequence with $t_1 = 14$ and $t_4 = \frac{4802}{729}$

A. 81.5 B. 63 C. 18 D. 14 E. NOTA

13. Find the shortest possible distance between the point (-2,5) and the line $3x–4y – 9= 0$.

A. 17/5 B. 7 C. $5\sqrt{2}$ D. $\frac{\sqrt{46369}}{24}$ E. NOTA

14. Naomi is a wonderful literature student and loves to read her favorite novel. She is also a superior mathematics student, and is quickly able to deduce that 834 digits were used to number the pages of the novel. How many pages are in Naomi's favorite novel?

A. 214 B. 215 C. 314 D. 315 E. NOTA

15. How many distinguishable permutations are in "mualphatheta"?

A. 479001600 B. 39916800 C. 19958400 D. 6652800 E. NOTA

16. Six poker buddies have been meeting semiweekly for a long time now. They sit around a circular table every time they meet and have exhausted every different arrangement just last week. How many weeks have they been playing cards, assuming every time they meet they use a different seating arrangement?

A. 60 B. 120 C. 360 D. 720 E. NOTA

17. Given: $(\log_{25} y)^2 + \log_{25} y - 2 = 0$, what is the sum of all possible solutions for y?

A. $\frac{15626}{625}$ B. $\frac{625}{15626}$ C. –1 D. –3 E. NOTA

18. Solve the following problem for X: $512_8 = X_7$

A. 168 B. 330 C. 343 D. 651 E. NOTA

19. Laura, a skilled painter, can paint an entire house in 12 hours. Patrick, Laura's assistant, needs 16 hours to do the same job. One day, Laura begins painting a house when, 2 hours later, Patrick joins her. Together, they finish painting the house. Approximately how many total minutes did Laura paint the house?

A. 343 B. 463 C. 20571 D. 27771 E. NOTA

20.Solve the system:

$$2x + 5y + z = -6$$
$$3x - y - z = -10$$
$$x - 2y + 2z = -12$$

Now find x + y + z.

A. 8 B. 1 C. -4 D. -6 E. NOTA

21. What are the vertical asymptotes of the following graph?

$$f(x) = \frac{3x^2 - 6x}{x^2 + 2x - 8}$$

A. x = 0, x = -4 B. x = 2 C. x = 2, x = -4 D. x = 0, x = 2, x = -4 E. NOTA

22. Find: $\begin{bmatrix} -10 & -3 \\ -7 & -2 \end{bmatrix}^{-1} + \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}^{T}$ Note: –1 denotes the inverse of the given matrix.

A. $\begin{bmatrix} 0 & 7 \\ 13 & -2 \end{bmatrix}$ B $\begin{bmatrix} 0 & -9 \\ -11 & 2 \end{bmatrix}$ C. $\begin{bmatrix} -32 & -84 \\ -22 & -58 \end{bmatrix}$ D. $\begin{bmatrix} 4 & 3 \\ -3 & 18 \end{bmatrix}$ E. NOTA

23. While visiting the Grand Canyon, Richard pulls his new Hi-Tech Wonderball from his pocket. Curious as to what would happen, he dropped the ball off a 5700 foot point into the canyon. Each bounce up travels 100 feet less that the previous one. Find the total distance, in feet; the ball travels between from the time it was dropped to the moment of the 5^{th} bounce. (Assume each bounce lands in the same place, so that the path of the ball could be modeled by a single line.)

A. 43,600 B. 49,300 C. 54,500 D. 55,000 E. NOTA

24. Give the area of an ellipse with the following equation:

$$9x^2 + 36y^2 - 54x - 360y = -657$$

A. 9π B. 18π C. 36π D. 324π E. NOTA

25. Last year, my brother Nathan was generously given $500 for his birthday. He needs to decide how to invest it. The Global Financing Bank would invest the money in an account that pays compound interest with a 9% rate quarterly. Another bank, First Central Investing, pays simple interest with a 14% interest rate. If he will invest the money for ten years, by how much does the Global Financing Bank exceed the First Central Investing bank in terms of interest received? Round to the nearest cent.

A. $1.30 B. $17.59 C. $254.86 D. $517.59 E. NOTA

26. Given: X>W>Z>Y. Also, W, X, Y, and Z are all distinct positive integers, and:

$$X^3 + Y^3 = 1729$$
$$W^3 + Z^3 = 1729$$

Find W + 2X + 3Y + 4Z.

A. 73 B. 75 C. 76 D. Cannot be determined E. NOTA

27. If: $\sum_{h=14}^{2003} (ht) = 14048405$, find t.

A. 4 B. 5 C. 6 D. 7 E. NOTA

28. Compute the number of factors of 7!.

A.6 B. 7 C. 60 D. 5040 E. NOTA

29. Solve: $\frac{n!\,(9n^2 + 2n^{-1} - 4.5)}{(2^n)^n}$ Assume n=4. Round to four decimal places.

A. 0.0512 B. 0.0513 C. 0.5127 D. 13.1250 E. NOTA

30. If f(2x) = 3 – 2x, find f(6). Solve over the set of real numbers.

A. -9 B. -3 C. -21 D. 6 E. NOTA