1. Find the 6th term of $(x + 1)^7$.

a. $105x^2$ b. $7x$ c. $21x^2$ d. $7/2\ x^2$ e. NOTA

2. Simplify: $(\log_{256}3)(\log_7 625)(\log_{3125}2048)(\log_9 49)$

a. 11/10 b. 1 c. 2/3 d. 11/12 e. NOTA

3. Find the minimum value of $\sqrt{x^2 + y^2}$ if $3x + 4y + 2 = 0$.

a. 2/5 b. 3/25 c. 2/7 d. 1/2 e. NOTA

4. Find an equation of the line through the intersection points of $3x^2 + 3y^2 + 8x - 11y + 13 = 0$ and $x^2 + y^2 + x - 6y + 10 = 0$.

a. $9x-17y+23=0$ b. $7x-5y+3=0$ c. $5x-7y-3=0$ d. $5x+7y-17=0$ e. NOTA

5. Find the remainder when $11^{47}$ is divided by 7.

a. 1 b. 5 c. 6 d. 4 e. NOTA

6. Given that $\cosh x = \frac{e^x + e^{-x}}{2}$ and $\sinh x = \frac{e^x - e^{-x}}{2}$, find

$\cosh^2 x - \sinh^2 x$.

a. $-1$ b. 0 c. 1 d. e e. NOTA

7. Given that $a = \text{Arcsin } x$, find $\sec(a)\cdot\tan(a)$

a. $x^2$ b. $\frac{\sqrt{1-x^2}}{x}$ c. $1-x^2$ d. $\frac{x}{1-x^2}$ e. NOTA

8. Imagine a rope tied tightly about the Earth's equator such that it touches the ground at every point of the equator. Suppose that Mr. Dorzan inserts a 12 inch section of rope somewhere on the equator. The rope is then uniformly pulled off the ground about the equator. Which of the following approximates the height of the rope from the ground. (Use $2 \times 10^7$ feet for the Earth's radius.)

a. 2 inches b. .2 inches c. .02 inches d. too small to measure e. NOTA

9. Find the distance between the line $(\cos a)x + (\sin a)y = p$ and the origin.

a. 1 b. $|p|$ c. $\left|\frac{p}{\sin a}\right|$ d. $\frac{|p|}{\sqrt{|\sin a + \cos a|}}$ e. NOTA

10. Simplify: $\frac{\cos 4x + \cos 2x}{2\cos^2 x}$

a. 1 b. $1 - 4\sin^2 x$ c. $4\cos^2 x - 3$ d. $\tan^2 x$ e. NOTA

11. Find the ratio of the radius of the inscribed circle to the radius of the circumscribed circle of a triangle with sides of lengths 4, 5, and 7.

a. 11/34 b. 13/36 c. 10/33 d. 12/35 e. NOTA

12. Find all values of x such that $\frac{a+b}{a} = \frac{b}{a+b}$ and $a = \frac{b}{2}x$.

a. $-1 \pm \sqrt{3}$ b. $1 \pm \sqrt{5}$ c. $-1 \pm i\sqrt{3}$ d. $-1 \pm \sqrt{5}$ e. NOTA

13. Evaluate: $\sum_{k=0}^{\infty} \frac{k-1}{2^k}$

a. -1 b. 0 c. 1 d. 2 e. NOTA

14. Find the ten's digit of 1! + 2! + 3! + ... + 1992!

a. 1 b. 2 c. 3 d. 4 e. NOTA

15. Given the set $\{ \pm e, \pm i, \pm j, \pm k \}$, the operation X as defined by the table below, and the properties listed which hold for all elements a and b of the given set, which axioms hold for this system?

| X | e | i | j | k |
|---|---|---|---|---|
| e | e | i | j | k |
| i | i | -e | k | -j |
| j | j | -k | -e | i |
| k | k | j | -i | -e |

$(-a) \text{ X } (-b) = a \text{ X } b$
$(-a) \text{ X } b = -(a \text{ X } b)$
$a \text{ X } (-b) = -(a \text{ X } b)$

I. Closure
II. Commutativity
III. Associativity
IV. An Identity Element exists
V. Each Element has an Inverse

a. all b. only III, IV, and V c. only IV and V d. all except II e. NOTA

16. Which of the following is equivalent to $\cos \frac{40\pi}{13}$ ?

a. $\sin \frac{14\pi}{13}$ b. $-\cos \frac{14\pi}{13}$ c. $-\sin \frac{\pi}{13}$ d. $\cos \frac{\pi}{13}$ e. NOTA

17. What is the period of the graph of $y = 2\tan(2x+4)$?

a. 2 b. -2 c. $\pi/2$ d. $\pi$ e. NOTA

18. Find the sum of the y-coordinates of all integral solutions of ordered pairs (x,y) if $5x^2 - xy - 2x + 7 = 0$.

a. 44 b. -4 c. -52 d. -8 e. NOTA

19. Find the area of the region bounded by $|y| = x - 1$ and $x = 5$.

a. 20 b. 14 c. 12 d. 10 e. NOTA

20. Select the valid conclusion for the given Lewis Carroll syllogism. The premises are as follows:
No terriers wander among the signs of the zodiac.
Nothing that does not wander among the signs of the zodiac is a comet.
Nothing but a terrier has a curly tail.

a. No comets have curly tails.
b. Only comets have curly tails.
c. All comets have curly tails.
d. Some comets do not have curly tails.
e. NOTA

21. Find the range of $y = -2 \sin (x + \pi/4) + 3$

a. $[-2,2]$ b. $[1,5]$ c. $[-\pi/4, 9\pi/4]$ e. $[-1,3]$ e. NOTA

22. Evaluate sin (Arc sin 1/4 + Arc cos 1/2)

a. $\frac{1+3\sqrt{5}}{8}$ b. $\frac{\sqrt{15}+4\sqrt{3}}{16}$ c. $\frac{4\sqrt{3}-\sqrt{15}}{16}$ d. $\frac{\sqrt{15}+2\sqrt{3}}{4}$ e. NOTA

23. The roots of the cubic $x^3 + Ax^2 + Bx + C = 0$ are in a geometric progression. If $B = C = 1 - i$, what is $A^3$?

a. $-2$ b. $2$ c. $-2i$ d. $2i$ e. NOTA

24. Two submarines starting from the same point cruise at 30 mph and 40 mph respectively. If their courses diverge by $120^0$, how many miles apart are they after 2 hours ?

a. $20\sqrt{31}$ b. $4\sqrt{654}$ c. $20\sqrt{37}$ e. $20\sqrt{13}$ e. NOTA

25. Which of the following represent(s) the area of $\Delta ABC$ whose sides are a, b, and c across from angles A, B, and C respectively?

I. $1/2\ bc \sin A$ II. $bc \sin \frac{A}{2} \cos \frac{A}{2}$ III. $\frac{b^2 \sin A \sin C}{2 \sin B}$

a. I only b. I and II only c. I and III only d. I, II, and III e. NOTA

26. Simplify: $(1 + i)^4(2 - 2i)^3$

a. $16+16i$ b. $64+64i$ c. $16i$ d. $8\sqrt{2} + 8\sqrt{2}i$ e. NOTA

27. Given $A = \begin{bmatrix} a & b \\ -b & a \end{bmatrix}$. Let $\delta(A)$ represent the determinant of A. $\delta(A) =$

a. $(a+bi)^2$ b. $|a + bi|$ c. $a^2 - b^2$ d. $|a + bi|^2$ e. NOTA

28. If $f(x) = \frac{1}{x^2 - 4}$ and $g(x) = \sqrt{x}$, what is the domain of $f(g(x))$ in interval notation?

a. $(2,4) \cup (4,\infty)$ b. $(-\infty,4) \cup (4,\infty)$ c. $[0,4) \cup (4,\infty)$ d. $[0,2) \cup (2,\infty)$ e. NOTA

29. Simplify: $\sqrt{\sqrt{133 + 44\sqrt{3}} + \sqrt{37 - 20\sqrt{3}}}$

a. 4 b. 5 c. 6 d. $2\sqrt{3}$ e. NOTA

30. Find the remainder when $100x^{100} + 5x^5$ is divided by $x + 1$.

a. 95 b. 105 c. 5 d. 4 e. NOTA