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Gaither-Leto Invitational

February 19, 1994

Algebra 2 Individual

Directions: You will have one hour to complete the following thirty questions. Work each problem, and choose the best answer. If the answer you get does not appear in choices A-D, choose NOTA, which stands for "none of the above". Scoring will be four times the number correct minus the number missed. Ties will be broken by the sudden death method beginning with number one.

1. If a right triangle with one leg of length 4 is inscribed in a circle of radius 2.5, find the sine of the smaller acute angle of the triangle.

- A. $4/5$
- B. $3/5$
- C. $3/4$
- D. not enough information
- E. NOTA

2. Given that $f(x) = \sqrt{x}$ and $g(x) = 2x - 1$, find $f^{-1}(g(5))$.

- A. 49
- B. -3
- C. 3
- D. 81
- E. NOTA

3. If two dice are rolled, find the probability of getting a sum greater than or equal to 8.

- A. $7/12$
- B. $1/3$
- C. $5/36$
- D. $5/12$
- E. NOTA

4. Evaluate: $(1+i)^8$

- A. 2
- B. 16
- C. 9
- D. $-8i$
- E. NOTA

5. Which of the following is the equation of a line passing through the point (2,1) with a slope of $-\frac{3}{5}$?

- A. $5x+3y=13$
- B. $3x+5y=-1$
- C. $5x+3y=-6$
- D. $3x+5y=11$
- E. NOTA

6. Marie decided to buy a new car. She went shopping and chose the car she liked best, which cost \$9995. However, she was able to get Tom-the-car-dealer to give her a \$500 factory rebate, plus a 10% discount after the rebate. What was the final cost?

- A. \$8496.50
- B. \$8996.50
- C. \$9495.00
- D. \$8545.50
- E. NOTA

7. Find the sum of the squares of the zeros of: $f(x)=2x^3-4x^2+10x+9$

- A. 4
- B. -6
- C. -1
- D. $-\frac{9}{2}$
- E. NOTA

8. Where is the center of $3x^2+2y^2+3x+6y-18=0$?

- A. (-2, -3)
- B. $(-\frac{3}{2}, -\frac{1}{2})$
- C. (3, 2)
- D. $(-\frac{1}{2}, -\frac{3}{2})$
- E. NOTA

9. If $[x]$ is defined as the greatest integer less than or equal to x , find

$$[e] - [-\pi] - [2.9999\dots] + [\log_2 11]$$

- A. 5
- B. 6
- C. 7
- D. 8
- E. NOTA

10. Find the value of $|24 - 7i|$, where $i = \sqrt{-1}$

- A. 17
- B. 31
- C. 21
- D. 0
- E. NOTA

11. Find the product of the following matrices:

$$\begin{bmatrix} 3 & 5 & 2 \\ 4 & 7 & 8 \end{bmatrix} \times \begin{bmatrix} -2 \\ 2 \\ 1/2 \end{bmatrix}$$

A. $\begin{bmatrix} 5 \\ 10 \end{bmatrix}$

B. $[5 \ 10]$

C. $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$

D. cannot be multiplied

E. NOTA

12. If x varies directly as y and inversely as z , and when $x=3$, $y=4$ and $z=-2$, then find z when $x=9/2$ and $y=5$.

A. $-15/4$

B. $-12/5$

C. $-3/5$

D. $-5/3$

E. NOTA

13. Factor completely: x^6-1

A. $(x+1)(x-1)(x^4+x^2+1)$

B. $(x+1)^3(x-1)^3$

C. $(x+1)(x-1)(x^2-x+1)(x^2+x+1)$

D. $(x+1)^3(x-1)(x-x+1)(x+x+1)$

E. NOTA

14. If $U=\{0,1,2,3,4,5,6,7,8,9\}$, $A=\{1,3,5,7,9\}$, $B=\{0,2,4,6,8\}$, and $C=\{1,5,8,9\}$, find $(A \cap C') \cup (B \cap C')$

A. $A' \cap B$

B. C'

C. $A \cap B'$

D. U

E. NOTA

15. Solve for x : $|2x-5| \geq 1$

A. $x \geq 3$ or $x \leq 2$

B. $2 \leq x \leq 3$

C. \mathbb{R}

D. \emptyset

E. NOTA

16. Given that $f(x)=x^3+2$ and $g(x)=|x-6|$, find $f(g(f(2))) - f(g(f(1)))$
- A. 37
 - B. 1
 - C. 3
 - D. 95
 - E. NOTA
17. Where are the foci of $17x^2-8y^2=68x-32y+100$?
- A. (2,7) (2,-3)
 - B. (5,2) (-1,2)
 - C. (7,2) (-3,2)
 - D. (2,5) (2,-1)
 - E. NOTA
18. Tandy (tj) is trying to woo Beth using a love potion. He visits Madame Ruth, but mistakenly buys 7 ounces of Love Potion No.8 (30% love potion, 70% water). How much of Love Potion No.10 (75% love potion, 25% water) must he add to get Love Potion No.9 (50% love potion, 50% water)?
- A. 3.1 ounces
 - B. 5.6 ounces
 - C. 3.5 ounces
 - D. 5.4 ounces
 - E. NOTA
19. If $A*B = 2A^2-3B+B^2$, find $3*7$.
- A. 98
 - B. 49
 - C. 46
 - D. 95
 - E. NOTA
20. Solve for x over the set of complex numbers: $x^3-x^2+2=0$
- A. $\{-1+i, -1-i, 1\}$
 - B. $\{1+i, 1-i, 1\}$
 - C. $\{-1+i, -1-i, -1\}$
 - D. $\{1+i, 1-i, -1\}$
 - E. NOTA
21. Change 3124_4 to base 7.
- A. 12052_7
 - B. 220_7
 - C. 1096_7
 - D. 433_7
 - E. NOTA

22. Find the 5th term in the expansion of $(2x+3y)^7$

- A. $35x^3y^4$
- B. $90620x^4y^4$
- C. $14580x^2y^5$
- D. $22680x^3y^4$
- E. NOTA

23. Which of the following is equivalent to:

$$\sqrt{2 - \frac{1}{\sqrt{2 - \frac{1}{\sqrt{2 - \dots}}}}}}$$

- A. -2
- B. 1
- C. $3/2$
- D. $7/5$
- E. NOTA

24. The numerator of a fraction is one less than twice the denominator. Adding 11 to both makes the numerator four more than the denominator. Find the sum of the numerator and denominator of the original fraction.

- A. 9
- B. 14
- C. 36
- D. 4
- E. NOTA

25. Simplify: $(\log_{\pi} 4)(\log_{12} 10) + (\log_{\pi} 3)(\log_{144} 100)$

- A. $\log_{\pi} 7$
- B. \log_{π}
- C. $\log_{\pi} 12$
- D. $\log_{\pi} 10$
- E. NOTA

26. Where is the vertex of $y^2 = 4x - 6y - 17$?

- A. (-2,3)
- B. (2,-3)
- C. (-3,2)
- D. (3,-2)
- E. NOTA

27. Determine the nature of the roots of $3x^2 - 7x + 5 = 1$

- A. 1 real, rational root
- B. 1 double, real root
- C. 2 distinct real roots
- D. 2 distinct imaginary roots
- E. NOTA

28. $\frac{12x-4}{(2x+3)(x-4)} = \frac{A}{2x+3} + \frac{B}{x-4}$ Find A-B

- A. 12x-4
- B. 0
- C. 16
- D. 8
- E. NOTA

29. If $f(x)=x^2+x+1$ and $g(x)=x-2$, find $f(g(x))$.

- A. x^2+x-1
- B. x^2-3x+3
- C. x^2-3x+5
- D. x^2+x+3
- E. NOTA

30. Tom has 18 more CD's than Marie. If they each buy four more CD's, then Tom will have one more than twice as many as Marie will have. How many CD's does Tom have now?

- A. 13
- B. 31
- C. 27
- D. 35
- E. NOTA