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**A.P. Leto Comprehensive High School
Mu Alpha Theta Invitational Competition
Saturday, February 2, 1991**

Algebra I Individual

1. For what value(s) of x does the following function not exist: $f(x) = \frac{(x+4)(2x+1)}{(x-3)(x+3)}$

- a) $\{3, -3\}$ b) $\{-4, \frac{-1}{2}\}$ c) $\{-4, -3\}$ d) $\{3\}$ e) NOTA

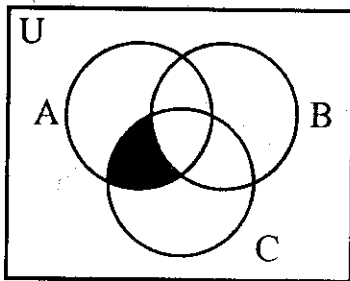
2. Solve for x and y given the following system of equations:

- $x + 2y = 7; 2y - x = 5$
- a) $(3, 1)$ b) $(-3, -1)$ c) $(2, 4)$ d) $(1, 3)$ e) NOTA

3. Find the equation of the line perpendicular to the line $x + 3y = 9$ and passing through the point $(4, 6)$.

- a) $x + 3y = 22$ b) $x - 3y = -14$
c) $3x - y = 6$ d) $3y - x = 14$
e) NOTA

4. Consider the Venn diagram:



Which of the following is a way of expressing the shaded area?

- a) $A \cup C$ b) $(A \cap C) - B$ c) $(A \cap C) \cup B$ d) $B - (A \cap C)$
e) NOTA

5. The tension T on a spring varies directly as the distance S it is stretched. If $T = 54$ when $S = 12$, find S if $T = 20$.

- a) $\frac{40}{9}$ b) $\frac{20}{51}$ c) 13 d) 4 e) NOTA

6. Given $f(x) = x^6 + x^5 + x^7$. Find the degree of the polynomial $+ f(2)$.

- a) 230 b) 231 c) 229 d) 199 e) NOTA

7. Given the line $y = 2x + 6$, find the equation of the line with the same y intercept but whose x intercept is 3 times that of the given line.

- a) $y = 6x + 6$ b) $2x + 3y = -18$
c) $2x - 3y = -18$ d) $2x + 3y = 18$
e) NOTA

8. If $f(x) = x^3$, find $\frac{f(2)}{f(4)} + \frac{f(4)}{f(2)} + \frac{f(3)}{f(6)}$.

- a) $\frac{33}{4}$ b) $\frac{65}{8}$ c) 8 d) $\frac{9}{8}$ e) NOTA

9. Evaluate: $\begin{vmatrix} 3 & 4 \\ 6 & 9 \end{vmatrix} + \begin{vmatrix} 5 & 4 \\ 3 & 3 \end{vmatrix}$

- a) 78 b) -4 c) 4 d) 6 e) NOTA

10. If $x > 0$, $y > 0$, and $z < 0$, which of the following is ALWAYS true?

- a) $z + x^2 - y^2 < 0$ b) $\frac{1}{x^2 + y^2 + z} > 0$
c) $\frac{x + y}{x + z} > 1$ d) $z - x^2 - y^2 < 0$
e) NOTA

11. Factor COMPLETELY: $x^4 - 16$

- a) $(x^2 + 4)(x + 2)(x - 2)$ b) $(x + 2)^2(x - 2)^2$
c) $(x^2 + 4)(x^2 - 4)$ d) $(x - 2)(x^2 + 2x + 4)$
e) NOTA

12. Which of the following is equivalent to $(2t^{-2})^{-3}$?

- a) $\frac{t^7}{8}$ b) $2t^2$ c) $\frac{t^{-5}}{8}$ d) $\frac{t^{-5}}{4}$ e) NOTA

13. Solve for x: $|x + 2| \leq 12$

- a) $x \leq -14$ or $x \geq 10$ b) $-14 < x < 10$
c) $-14 \leq x \leq 10$ d) $x \leq 10$
e) NOTA

14. When a rectangular piece of paper is folded in half, a square of area 16 is formed. Find the perimeter of the piece of paper.

- a) 4 b) 24 c) 32 d) 12 e) NOTA

15. If $2x - 6$ represents an odd number, the next greatest consecutive odd number can be represented by:

- a) $2x - 4$ b) $2x - 5$ c) $2x - 8$ d) $2x - 7$ e) NOTA

16. Given the lines $3x - y = 15$ and $y = x + 1$ and that they intersect in Quadrant Q at the point (H, K), find $H + K + Q$.

- a) 16 b) 18 c) 20 d) 21 e) NOTA

17. If $a = b$ and $c = 2b + a$, what property makes the statement $c = 3b$ true?
 a) transitive property b) substitution property
 c) associative property d) distributive property
 e) NOTA

18. Given $t < 0$, solve for t in the following equation: $1 = \frac{1}{t} + \frac{6}{t^2}$
 a) $t = -2$ b) $t = -3$ c) $t = -2, -3$ d) $t = -6$ e) NOTA

19. Simplify: $\frac{\frac{1}{a^2} + 2}{a^{-3} - 4a}$

- a) $\frac{a + 2a^3}{1 + 4a^4}$ b) $\frac{a}{a + 2a^2}$
 c) $\frac{1}{1 - 2a^2}$ d) $\frac{a}{1 - 2a^2}$
 e) NOTA

20. If Bob can clean his pool in 12 hours and Gloria only takes 7 hours, how long will it take for both to complete the job if they work together?

- a) 5 hours b) 9.5 hours c) $\frac{84}{19}$ hours d) 2.5 hours e) NOTA

21. Find the reciprocal of the sum of the reciprocals of 3rd and 4th whole numbers.

- a) $\frac{5}{6}$ b) 5 c) $\frac{6}{5}$ d) $\frac{12}{7}$ e) NOTA

22. If $f(x) = x^2 - x$ and $g(x) = x^2 + x$, evaluate the following: $\frac{f(g(f(2)))}{g(f(g(2)))}$.

- a) 1 b) $\frac{1}{31}$ c) $\frac{7}{155}$ d) $\frac{1}{13}$ e) NOTA

23. At a particular car dealership, 22 cars have radios, 30 have 4 wheel drive, and 30 have a five year warranty. Thirteen cars have both a radio and 4 wheel drive. 9 cars have ONLY 4 wheel drive and a five year warranty. 11 cars have a radio and a five year warranty. How many cars have ONLY a five year warranty?

- a) 4 b) 8 c) 10 d) 16 e) NOTA

24. The water of Great Salt Lake contains about 20% of mineral substances. How much pure water must be added to 100 pounds of this water so that the mixture shall contain only 5% of minerals?

- a) 300 lbs b) 400 lbs c) 25 lbs d) 500 lbs e) NOTA

25. The sum of three consecutive even integers is -30. Find the product of these numbers.

- a) -1000 b) -2688 c) -960 d) -1680 e) NOTA

26. Given that a person wishes to pay a bill of \$4.35 using only 2 types of coins, and an equal number of each, what two coins must be used? (Consider only pennies, nickels, dimes, and quarters.)

- a) dimes and quarters
- b) pennies and nickels
- c) nickels and quarters
- d) nickels and dimes
- e) NOTA

27. A square plot would contain 63 square feet more if each side were one foot longer. What is the area of the plot?

- a) 49 square feet
- b) 961 square feet
- c) 900 square feet
- d) 1024 square feet
- e) NOTA

28. Given that $p^q = .32$ and $q^n = .26$, evaluate the following: $p^{2q} + q^{2n}$

- a) .17
- b) 1.16
- c) .16
- c) 1.17
- e) NOTA

29. Find the slope of the line through the point $(-3, 4)$ and $(3, -4)$.

- a) $\frac{4}{3}$
- b) $-\frac{3}{4}$
- c) $\frac{3}{4}$
- d) 0
- e) NOTA

30. Solve for x : $|x| + x \leq 0$

- a) $x < 1$
- b) $x < 0$
- c) $x \leq 0$
- d) $x > 0$
- e) NOTA