GRISSOM MATH TOURNAMENT
APRIL 17, 2010
ALGEBRA II TEST

1. Solve for x: $8(2x - 5) + 11 = 2(7x + 4) - 13$.

A. -14 B. 1 C. 12 D. 28 E. 30

2. Simplify completely: $\dfrac{2x^2 - 11x - 21}{x^2 - 6x - 7}$.

A. $\dfrac{2x-3}{x-1}$ B. $\dfrac{2x-3}{x+1}$ C. $\dfrac{2x+3}{x-1}$ D. $\dfrac{2x+3}{x+1}$ E.none of these

3. Evaluate: $\log_9 27 + \log_4 32$.

A. 2 B. 3 C. 4 D. 5 E. 6

4. Write in a + bi form: $\dfrac{16}{i^8} - \dfrac{7}{i^{12}} + \dfrac{9}{i^3} - \dfrac{5}{i}$.

A. B. 9 + 4i C. 9 + 14i D. E.

5. Solve for x: $\begin{vmatrix} 3x+2 & 2x-3 \\ 7 & 5 \end{vmatrix} = 35$

A. 4 B. 29 C. 34 D. 39 E. 42

6. Find all complex solutions for z in the following equation: $z^2 - 10z + 28 = 0$.

A. 2 B. -4i, 7i C. $5 \pm \sqrt{3}$ D. $5 \pm i\sqrt{3}$ 10. $10 \pm i\sqrt{3}$

7. Find the value of the following determinant: $\begin{vmatrix} 6 & -3 & 6 \\ -3 & 6 & -6 \\ 1 & 1 & 1 \end{vmatrix}$.

A. -36 B. 27 C. 43 D. 117 E. 153

8. Ellen makes a single investment of money into an unusually generous bank which compounds interest continuously. After two years, she withdraws her entire savings, which is four times as much money as she originally deposited. Sam, amazed by her good fortune, invests P dollars in the same bank at the same interest rate. At the end of four years, how much does she have in the bank?

A. $2\sqrt{2}$ P B. 4P C. 8P D. 16P E. (8 ln2)P

9. A parabola with equation $y=ax^2 + bx + 8$ has a vertex at (2, -7). Find the value of a + b.

A. $-\frac{3}{2}$ B. $\frac{1}{2}$ C. $\frac{75}{4}$ D. $-\frac{45}{4}$ E. none of these

10. Find the product of the coefficients of polynomial q(x) if $q(x) = \frac{2x^4 + 11x^3 - 16x^2 + 28x - 49}{x + 7}$.

A. -900 B. -600 C. -210 D. 210 E. 600

11. Find the point of intersection in the first quadrant of the graphs with equations: $y = x^2 - 5$ and $y = x + 7$.

A. (3, 4) B. (3, 10) C. (4, -3) D. (4, 3) E. (4, 11)

12. Let a= the number of distinct arrangements of the letters in the word GLASSES and b= the radius of the circle with equation $x^2 + y^2 - 8x - 2y + 16 = 0$, find the value of $i^a \cdot i^b \cdot i^{ab}$ where $i=\sqrt{-1}$.

A. -1 B. 1 C. i D. –i E. $\sqrt{i}$

13. Find the product in simplest form of the least and greatest of the following: $\log_4 7, \log_2 7, \log_3 10, \log_5 4$, and $\log_5 2$.

A. $\log_5 7$ B. $\log_2 10$ C. $\log_7 5$ D. $\log_3 4$ E. $\log_2 3$

14. Given the function g(x) = 3x + 4, solve for x where g(2x + 1) = 19.

A. -2 B. 2 C. $\frac{7}{3}$ D. $\frac{8}{3}$ E. 5

15. Let a, b, and c all exceed 1, and let d be a positive number such that $\log_a d = 8$, $\log_b d = 12$, and $\log_{abc} d = 4$. Find the value of $\log_c d$.

A. 2 B. 4 C. 12 D. 16 E. 24

16. Evaluate: $\sin\frac{\pi}{4} - \cos\frac{\pi}{3} + \tan\frac{3\pi}{4} - \csc\frac{5\pi}{4} + \sec\frac{4\pi}{3}$

A. $\frac{5\sqrt{2}-3}{2}$ B. $\frac{3\sqrt{2}-7}{2}$ C. $\frac{5\sqrt{2}-3}{4}$ D. $\frac{7\sqrt{2}}{2}$ E. $\frac{3\sqrt{2}-5}{2}$

17. In order to spend less money on awards for the top competitors in a race, the officials decide that the three cars in the last three positions at the end of the race will each pay the prizes for those who place in the first three positions. Each position 4^{th}, 5^{th}, and 6^{th} must pay a different amount. How many possible arrangements of the 4^{th}, 5^{th}, and 6^{th} place are possible if six cars enter the race?

A. 60 B. 90 C. 120 D. 240 E. 360

18. Find the sum of the reciprocals of the roots of: $6x^3 - 43x^2 + 5x + 14 = 0.$

A. $-\frac{14}{43}$ B. $-\frac{5}{14}$ C. $\frac{14}{5}$ D. $\frac{43}{5}$ E. $\frac{43}{14}$

19. Greg rolls 3 six-sided dice. Find the probability that the sum of the 3 dice is less than 9?

A. $\frac{23}{108}$ B. $\frac{13}{54}$ C. $\frac{7}{27}$ D. $\frac{13}{36}$ E. $\frac{11}{27}$

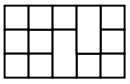
20. Two circles with equations $x^2 + y^2 + 4x - 10y + 13 = 0$ and $x^2 + y^2 - 12x + 2y + 1 = 0$ share one common internal tangent. Find the equation in standard form of this tangent line.

A. 4x - 3y = -3 B. 4x + 3y = 155 C. 3x - 4y = -8 D. 3x + 4y = -14 E. none of these

21. Find the sum of the digits in the solution to the equation: $\frac{\log 2 \cdot \log_2(\log_4 x)}{\log 16} = \frac{1}{2}.$

A. 4 B. 7 C. 12 D. 13 E. 16

22. How many ways can KC travel from the lower left corner to the upper right corner moving only up and right along grid lines?



A. 18 B. 24 C. 34 D. 46 E. 56

23. John asked 100 people what dessert they had for lunch. Fifty-six had cookies, 42 had brownies, and 21 had chocolates. Twelve had both cookies and brownies, 8 had both cookies and chocolates, 9 had both brownies and chocolates, and 3 said they had all three desserts. How many students didn't have any desserts?

A. 1 B. 7 C. 9 D. 10 E. 11

24. For the equation $y = \frac{(x^4 - 3x^3 - 4x^2 + 12x)(x + 7)}{x(x^2 - 4)(x^2 - 49)}$, let h= the number of holes the graph of y and a= the number of vertical asymptotes in the graph of y. Solve for t in the equation: $at^2 - ht + ha = 0.$

A. 0 B. 1 C. 2 D. 3 E. 4

25. Find the area of the region enclosed by the graph of: $|2x| + |y + 3| \le 4$

A. 12 B. 16 C. 24 D. 32 E. 48

TB1: If A is the sum of the roots of $x^2 - 5x - 11 = 0$, B is the product of the roots of $2x^2 + 5x + 1 = 0$, and C is the number of distinct arrangements of the letters in the word GRISSOM, find BC/A.

TB2: Find the sum of the odd integral factors of 720.

TB3: What is the largest number less than 2010 that has a remainder of 2 when divided by 5 and a remainder of 5 when divided by 7?