Grissom Math Tournament

20 ALGEBRA II 14

Written Test

1. Sixty minutes will be allowed for completing this examination. The monitor will keep time. Students must stay in the room for the full sixty minutes.

2. No calculators, books, notes, or other aides may be used. Your monitor will supply scratch paper; you may not furnish your own. If you need more scratch paper during the test, raise your hand and the monitor will bring it to you.

3. You will receive four points for each correct answer minus one point for each incorrect answer on the twenty-five multiple choice questions. There are three tie breakers at the end of the test. Correct answers on the tie breakers are worth one-tenth of a point. Your score on the written test is the sum of these two scores.

4. If there are ties after the scores are computed as described in point 3 above, we will break them by counting number 25, then number 24, then number 23, and so on in this order as tie breakers.

5. Please give the monitor your answer sheet before you leave. You may keep the test copy. ***Be sure to bubble your student number in the appropriate place on your answer sheet. Otherwise, your paper will not be graded.***

1. Simplify: $2(5-3i)-4i(7+2i)$.

   A. $18+22i$ B. $2-34i$ C. $18-22i$ D. $18-34i$ E. $2-22i$

2. Mr. Grissom is older than his wife. In fact, by adding his son's age to his wife's age, you obtain Mr. Grissom's age. Six years from now, Mr. Grissom will be three times as old as his son. At that same time, his age will also be twice the difference between his wife's and son's ages. What is the sum of Mr. And Mrs. Grissom's ages?

   A. 54 B. 48 C. 44 D. 42 E. 40

3. Evaluate: $\left(4^{-1}-3^{-1}\right)^{-1}$

   A. -12 B. -1 C. 1/12 D. 1 E. 12

4. Evaluate: $\sqrt{\frac{1}{9}+\frac{1}{16}}$.

   A. $\frac{1}{4}$ B. $\frac{2}{7}$ C. $\frac{5}{12}$ D. $\frac{1}{2}$ E. $\frac{7}{12}$

5. A circle with center at the origin passes through (2, 3). An equation of the tangent line to the circle at (2, 3) would be:

   A. $2x+3y=-27$ B. $2x+3y=13$ C. $2x-3y=-5$ D. $3x-2y=0$ E. $3x-2y=7$

6. What is the maximum value of the function $f(x)=-3x^2-24x-44$?

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

7. A letter is picked at random from the alphabet. What is the probability that the letter is contained in the word "CHAIR" or in the word "HANGER" or both?

   A. 3/26 B. 11/26 C. 7/13 D. 4/13 E. 5/13

8. If the line with the equation $2x + Ay = B$ has solutions (5, 1) and (2, 3), then the product of A and B is:

   A. -21 B. 16 C. 21/2 D. 29 E. 39

9. Which of the following is equivalent to: $\left(1+217^{\pi}\right)^{-1}+\left(1+217^{-\pi}\right)^{-1}$?

   A. 1/217 B. 1 C. -1 D. 217 E. -1/217

10. Find the smallest positive perfect square that is divisible by 120.

    A. 14400 B. 2400 C. 8100 D. 3600 E. 6400

11. Find the finite sum, if there is one, of the infinite geometric series $3 - 1 + 1/3 - 1/9 + \ldots$.

A. 0 B. 9/2 C. 9/4 D. 4/9 E. infinite

12. What is the value of a if $x^5 + ax^4 + 48$ is divisible by x-2?

A. -26 B. -14 C. -8 D. -2 E. none of these

13. What is the fourth term in the expansion of $(3x-2y)^6$?

A. $4320x^3y^3$ B. $-3240x^3y^3$ C. $3240x^4y^2$ D. $-4320x^3y^3$ E. $4320x^4y^2$

14. If (a, 0) and (0, b) are equidistant from the points (1, 4) and (9, 0), find a + b.

A. -5 B. -4.5 C. -4 D. -3.5 E. -3

15. If $\log_{21} 7 = a$ and $\log_{21} 6 = b$, find $\log_{21} 2$ in terms of a and b.

A. $a+b-1$ B. $a+b+1$ C. $\frac{a+1}{b}$ D. $ab+1$ E. $\frac{a-1}{b}$

16. How many points of intersection do the parabolas $y = x^2 + 5$ and $3y = x^2 + 8x + 7$ have?

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

17. A speeder passes a policeman at 90 mph and continues at that speed. If the policeman takes 30 seconds to get his car started, what speed must he average to catch the speeder in 5 more minutes?

A. 101 mph B. 100 mph C. 99 mph D. 98 mph E. 97 mph

18. Which of the following is an equation for the circle with center (-3/5, 1) and radius $3\sqrt{3}$?

A. $25x^2 + 25y^2 + 30x - 50y + 5 = 646$ B. $25x^2 + 25y^2 + 30x - 50y - 5 = 646$

C. $25(x^2 + y^2) - 10(3x + 5y + 2) = 621$ D. $25(x^2 + y^2) + 10(3x + 5y - 2) = 621$

E. none of these

19. In a certain school there are 65 people who play the three sports football, basketball, and baseball. 42 play football, 31 play basketball, and 27 play baseball. 15 play both football and basketball, 13 play both basketball and baseball. How many people play baseball and football, but not basketball?

A. 7 B. 5 C. 11 D. E. not enough information

20. If x, y, and z satisfy the system of equations: $\begin{cases} 2x - 3y + 5z = 12 \\ x + 4y - 3z = -1 \end{cases}$, then find the value of 5x – 24y + 29z.

A. 47 B. 49 C. 51 D. 58 E. 59

21. Simplify: $1-\dfrac{x}{1-\dfrac{x}{1-\dfrac{x}{1-x}}}$

A. $\dfrac{1-4x+x^2}{1-3x+x^2}$ B. $\dfrac{3x^2-4x+1}{x^2-3x+1}$ C. $\dfrac{1-x^2-x}{1-2x}$ D. $\dfrac{1-2x}{1-x}$ E. $\dfrac{1-4x+x^2}{1-2x}$

22. Solve for x: $\log x^{\log x}-\log x^3-\log 10{,}000=0$

A. $\{10^{-1},10^4\}$ B. $\{-1,4\}$ C. $\{10^4\}$ D. $\{4\}$ E. $\{-1\}$

23. In a survey of 93 people, 25 claimed that they disliked both chocolate and vanilla ice cream. 40 people said they liked chocolate and vanilla. Totalled, 15 more people liked chocolate than liked vanilla. No one liked vanilla and strawberry while disliking chocolate. 44 liked at least two flavors. If 30 people liked strawberry and 14 liked all three flavors, how many liked none of the flavors?

A. 6 B. 7 C. 12 D. 13 E. not enough info

24. Solve for (x, y): $\dfrac{1}{729}\left(3^{2x}\right)=9\left(9^{y}\right)$ and $\dfrac{1}{4}\left(16^{x}\right)=16\left(8^{-2y}\right)$

A. (-3, 1) B. (3, -1) C. (1, 0) D. (1/3, -1) E. (3, 1)

25. Given that $\log_{10}3\approx 0.4771$, $\log_{10}2\approx 0.3010$, what is the largest whole number, *n*, with $2^n<3^{100}$?

A. 94 B. 98 C. 158 D. 210 E. 159

TB1. Evaluate: $(-27)^{\frac{2}{3}}\left(\dfrac{1}{4}\right)^{-\frac{5}{2}}$

TB2. If a ball is dropped from a height of 10 feet and bounces 9/10 of the height each time it bounces, what is the total distance traveled by the ball before coming to rest?

TB3. Find the sum of the first 40 terms of the series: 1 + 2 + 4 + 5 + 7 + 8 + 10 + 11 +… where every third integer is missing.