Oklahoma Math Day

November 16, 2016

Algebra II

INSTRUCTIONS:

1. Do not begin the test until told to do so.
2. Calculators are not permitted.
3. Be sure to enter your name and high school code on the answer sheet.
4. Use a number 2 pencil to fill out your answer sheet.
5. Please remain in your seat until time is called.

Algebra II Test

(with answers on the last page)

---

1. The expression $(x^2 - y^2)/(x - y)$ equals

   (A) $x - y$ (B) $x + y$ (C) $y - x$ (D) $x^3 - y^3$ (E) None of the above.

---

2. If $f(x) = x+1$ then what is the value of $f(f(f \cdots f(x) \cdots))$, where the function f is applied 2016 times to x?

   (A) $2015x + 1$ (B) $2015x + 2016$ (C) $x + 2015$ (D) $x + 2016$ (E) None of the above.

---

3. Zach goes on a long drive. He travels the first 200 miles with a speed of 50 miles per hour, and the rest of the trip at 60 miles per hour. If his average speed for the entire trip is 55 miles per hour then how many miles did he travel?

   (A) 400   (B) 500   (C) 440   (D) 800   (E) None of the above.

---

4. What is the probability that a randomly chosen divisor of 2025 will be divisible by 5?

   (A) 3/5   (B) 11/15   (C) 2/3   (D) 7/15   (E) None of the above.

---

5. Find the number which is two fifths of the way between $\dfrac{1}{3}$ and $\dfrac{6}{7}$ on the number line.

   (A) $\dfrac{19}{35}$ (B) $\dfrac{22}{105}$ (C) $\dfrac{46}{105}$ (D) $\dfrac{25}{42}$ (E) None of the above

---

6. If $\sqrt{1} + \sqrt{9} = \sqrt{x}$, then $x =$

   (A) 10   (B) 4   (C) 16   (D) 100   (E) None of the above.

7. How many positive integers a are there for which the equation $a + b + ab = 200$ has a solution for some integer b?

   (A) 0   (B) 3   (C) 4   (D) 7   (E) None of the above.

8. If x and y are real numbers such that $x^2 > y^2$, which of the following inequalities must hold?

   (A) $x > y$ (B) $x + y > 0$ (C) $x^2 > y$ (D) $|x| > |y|$ (E) None of the above.

9. How many ordered pairs of positive integer numbers have greatest common divisor 12 and least common multiple 792?

   (A) 8   (B) 3   (C) 5   (D) 6   (E) None of the above.

10. How many different vertical asymptotes does the graph of $y = \dfrac{2x^3 + 5x^2 - x - 6}{x^4 - x^3 - 6x^2}$ have?

   (A) 0   (B) 1   (C) 2   (D) 3   (E) None of the above.

11. The repeating decimal number $0.277777\ldots$ is equal to a/b in the simplest fraction form. What is $b - a$?

   (A) 13   (B) 23   (C) 26   (D) 46   (E) None of the above.

12. How many trailing zeroes are at the end of the number 25! when it is written in base 8?

   (A) 5   (B) 6   (C) 7   (D) 8   (E) None of the above.

13. Let r be the sum of $2015/2016$ and its reciprocal. Which of the following holds:

   (A) $r < 1$ (B) $1 < r < 2$ (C) $r = 2$ (D) $2 < r < 3$ (E) None of the above.

14. How much larger than 2015^2 is 2016^2?

   (A) 8124481   (B) 4031   (C) 2016   (D) 1   (E) None of the above.

15. To the nearest integer how much larger than $\sqrt{2015}$ is $\sqrt{2016}$?

   (A) 1   (B) 4030   (C) 2016   (D) 0   (E) None of the above.

16. If m and n are positive integers such that $7/10 < m/n < 5/7$ then what is the smallest possible value of n ?

   (A) 10   (B) 12   (C) 17   (D) 21   (E) None of the above.

17. In how many different ways can 63 be written as the sum of two or more consecutive positive integers?

    (A) 1   (B) 2   (C) 3   (D) 4   (E) None of the above.

18. How many real solutions does the equation $x^3 - 2016x + 1 = 0$ have?

    (A) 0   (B) 1   (C) 2   (D) 3   (E) None of the above.

19. If r_1 and r_2 are the solutions to the quadratic equation $x^2 + 2x - 5 = 0$, then $(r_1 - r_2)^2$ equals:

    (A) 4   (B) 6   (C) 12   (D) 24   (E) None of the above.

20. Five consecutive integers have the property that the sum of the first 4 four is exactly three times the fifth. Find the sum of the next five consecutive integers.

    (A) 80   (B) 65   (C) 55   (D) 90   (E) None of the above.

21. Find the sum of all integers n for which $(19n + 7)/(7n + 11)$ is an integer.

    (A) 3   (B) -14 (C) -1 (D) 0   (E) None of the above.

22. Jeff's Algebra I test average will be a 88 if he gets a 72 on the next exam and a 91 if he gets a 90 on the next exam. If all exams are weighted the same, how many exams has Jeff taken so far?

    (A) 3   (B) 4   (C) 5   (D) 6   (E) None of the above.

23. Let $g(x) = x^2 + x + 1$ and $f(x) = mx - 3m$ where $m > 0$. Determine the value of m for which $f(x) = g(x)$ has a unique solution.

    (A) -3 (B) $-5 + 2\sqrt{7}$ (C) $7 + 2\sqrt{13}$ (D) 3   (E) None of the above.

24. If $x = \sqrt{5 + \sqrt{5 + \sqrt{5 + \cdots}}}$ then what is the value of $x^2 - x$?

    (A) 0   (B) $5\sqrt{5}$ (C) 5   (D) $\sqrt{5}$ (E) None of the above.

25. The sum $100^2 - 99^2 + 98^2 - 97^2 + \ldots + 2^2 - 1^2$ equals

    (A) 5050   (B) 5151   (C) 5052   (D) 4950   (E) None of the above.

26. When 60 minutes elapse on a correct clock, 62 minutes register on clock F (fast) and only 56 minutes register on clock S (slow). If later in the day clock F reads $8:00$ and clock S reads $7:00$, what was the correct time when the two clocks were originally set?

    (A) $4:20$ (B) $6:40$ (C) $7:20$ (D) $8:20$ (E) None of the above.

Answers for the 2016 Algebra II Test:

1-5:	BDCCA
6-10:	CBDAC
11-15:	ACDBD
16-20:	CEDDB
21-25:	BCCCA
26:	E