OU Math Day 2006

Higher Algebra Test

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1. What is the largest integer smaller than $\sqrt{2006}$?

   (A) 42 (B) 43 (C) 44 (D) 45 (E) None of the above

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2. Tim's age is twice of Brian's while Sally's age is half of Brian's. In 14 years the sum of their ages will be 63 which will be the age of their uncle John's age at that time. What is the sum of Tim, Brian, Sally and uncle John's current ages?

   (A) 21 (B) 42 (C) 70 (D) 84 (E) None of the above

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3. On a certain math test the scores of 9 of the 10 students who took the test were

   $$85, 84, 69, 91, 80, 77, 92, 96, \text{ and } 76\ .$$

   If the mean score for all ten students was 83, what grade did the tenth student make?

   (A) 80 (B) 83 (C) 90 (D) 84 (E) None of the above

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4. How many distinct real number solutions does the equation

   $$x^3(2x-3)^3(2x^2+1)(2x^2-1)(x^2+4x-11)^2(x^2+4x+11)=0$$

   have?

   (A) 10 (B) 8 (C) 6 (D) 5 (E) None of the above

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5. The expansion of $(a+1)^5$ is

(A) a^5+1 (B) $a^5+5a^3+5a^2+1$ (C) $a^5+a^4+a^3+a^2+a+1$
(D) $a^5+5a^4+10a^3+10a^2+5a+1$ (E) None of the above.

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6. Which of the following is the fractional form of $1.2\overline{6}$?

(A) 19/15 (B) 125/99 (C) 63/50 (D) 38/33 (E) None of the above

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7. How many solutions for x does the equation $|3-x| = |2x-1|$ have?

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

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8. If $5x+6y = 2006$ and $6x+5y = 6002$, then $x+y =$

(A) 0 (B) 169 (C) 56 (D) 728 (E) None of the above

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9. If the quadratic equation $x^2+bx+c = 0$ has exactly one solution r then b/c is equal to

(A) $-2/r^2$ (B) $-2/r$ (C) 1 (D) $2/r^2$ (E) $2/r$

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10. Which of the following numbers is largest?

(A) 2^{3^5} (B) 2^{5^3} (C) 3^{2^5} (D) 3^{5^2} (E) 5^{3^2}

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11. Determine $g(f(x)) - f(g(x))$ when $f(x) = x^2 + 3x + 2$ and $g(x) = x^2 + 2x + 3$

(A) 0 (B) $2x^3 + 2x^2 - 9$ (C) $2x^2 + 4$ (D) $9 - 2x^2 - 2x^3$ (E) None of the above

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12. How many solutions (x, y, z) does the system of equations $\{xy - z = 0, xz - y = 0, yz - x = 0\}$ have?

(A) 2 (B) 3 (C) 4 (D) 5 (E) None of the above

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13. What is the remainder when $1 + 3 + 3^2 + 3^3 + 3^4 + 3^5 + 3^6 + 3^7$ is divided by 5 ?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

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14. What is the remainder when 3^{2006} is divided by 5 ?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

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15. Determine the sum of the solutions to the equation $\sqrt{4t + 15} - 3 = \sqrt{2t - 1}$.

(A) 11 (B) 3 (C) 9 (D) 12 (E) None of the above

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16. There are three consecutive odd integers such that the sum of the smallest and four times the largest is 61. What is the sum of the three integers?

(A) 39 (B) 33 (C) 30 (D) 27 (E) None of the above

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17. Simplify $\dfrac{(2x^2-5x-3)(x^2-x-20)}{(x^2-8x+15)(2x^2+9x+4)}$

(A) $\dfrac{x+4}{x-3}$ (B) $\dfrac{2x+1}{2x-1}$ (C) $\dfrac{x-5}{x+5}$ (D) 1 (E) None of the above

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18. If $x+y=6$ then $x^2=$

(A) $y^2-12y+36$ (B) y^2-36 (C) $y^2-12y-36$ (D) $36-y^2$ (E) None of the above

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19. A palindrome is an integer whose digits are the same when read forward or backwards. For example, both 1 and 373 are palindromes. How many integers between 1 and 2006 are palindromes?

(A) 83 (B) 99 (C) 109 (D) 119 (E) None of the above

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20. An integer m is written in base 7 as $m = 1406$. What is the base 4 expression for m?

(A) 31320 (B) 1101111000 (C) 111332 (D) 111000 (E) None of the above.
