OU Math Day 2010

Higher Algebra Test

(with answers on the last page)

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1. If $3y - 1 = 1 - 2y$ then y equals

   (A) $-\frac{2}{5}$ (B) $\frac{2}{5}$ (C) $\frac{5}{2}$ (D) $-\frac{5}{2}$ (E) None of the above

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2. Find the sum of the distinct prime integer divisors of 2010

   (A) 10 (B) 21 (C) 77 (D) 208 (E) None of the above

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3. Which of the listed integers is closest to the cube root of 2010?

   (A) 0 (B) 10 (C) 13 (D) 21 (E) 43

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4. Which of the five listed numbers is largest?

   (A) $\frac{12}{21}$ (B) $\frac{1/12}{21}$ (C) $\frac{12}{1/21}$ (D) $\frac{1/12}{1/21}$ (E) 1

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5. Which of the five listed numbers is middle in size?

   (A) $\frac{12}{21}$ (B) $\frac{1/12}{21}$ (C) $\frac{12}{1/21}$ (D) $\frac{1/12}{1/21}$ (E) 1

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6. Find the number which is one fourth of the way from $\frac{5}{8}$ to $\frac{3}{4}$ on the number line.

(A) $\frac{27}{32}$ (B) $\frac{7}{8}$ (C) $\frac{28}{31}$ (D) $\frac{21}{8}$ (E) None of the above

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7. Suppose that numbers a and b satisfy the equations $2a+b=0$ and $-a+2b=5$. Determine the value of the product ab.

(A) -2 (B) 2 (C) $-1/2$ (D) $1/2$ (E) None of the above

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8. How many real solutions does the equation $|1-5x| = x^2+1$ have?

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

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9. What is the y-intercept of the line $5x+3y=1$?

(A) $\frac{1}{5}$ (B) 3 (C) $\frac{5}{3}$ (D) $\frac{1}{3}$ (E) None of the above

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10. Let A be a positive real number with $\sqrt{A\sqrt{A\sqrt{A}}} = 128$. What is the value of $\sqrt{\sqrt{\sqrt{A}}}$?

(A) 2 (B) 4 (C) 8 (D) 256 (E) None of the above

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11. If the two solutions to the equation $x^2+6x-4=0$ are x_1 and x_2 what does x_1+x_2 equal?

(A) -6 (B) $2\sqrt{13}$ (C) 6 (D) 12 (E) None of the above

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12. Find the simplest radical form of $\sqrt{14}\sqrt{35}\sqrt{10}$

(A) $35\sqrt{2}$ (B) $7\sqrt{10}$ (C) 70 (D) $2\sqrt{35}$ (E) None of the above

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13. Let $P(x)$ be the sixth degree polynomial defined by

$$P(x) = x^6 + ax^5 + bx^4 + ax^3 + bx^2 + x + 1$$

for constants a and b. If $x = 1$ and $x = -1$ are roots of $P(x) = 0$ then what does b equal?

(A) 0 (B) 2 (C) -1 (D) $-\dfrac{3}{2}$ (E) None of the above

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14. If $f(x) = \dfrac{x^2 - 16x + 49}{x - 12}$ then what integer is closest to the value of $f(12.1)$?

(A) 21 (B) 18 (C) 12 (D) 10 (E) None of the above

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15. Among all real numbers x what is the smallest value that the expression $2x^2 + 6x + 1$ achieves?

(A) $\dfrac{29}{2}$ (B) $\dfrac{3}{2}$ (C) 1 (D) $-\dfrac{7}{2}$ (E) None of the above

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16. How many integers t satisfy both of the inequalities $(t + 4)(t - 3) \leq 0$ and $1 - 3t \geq 0$?

(A) one (B) three (C) four (D) infinitely many (E) None of the above

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17. The two circles $(x - 1)^2 + (y + 2)^2 = 16$ and $(x - 2)^2 + (y - 1)^2 = 1$

(A) do not intersect (B) intersect in exactly one point (C) intersect in exactly two points
(D) intersect in more than two points (E) None of the above

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18. What is the remainder when 11^{22} is divided by 100?

(A) 1 (B) 11 (C) 21 (D) 81 (E) None of the above

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19. Determine the square root of z given that the fifth root of $z - 41$ equals -2 ?

(A) 3 (B) 0 (C) $\sqrt{73}$ (D) 73 (E) None of the above

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20. Write the repeating decimal $.\overline{648} = .648648648648\cdots$ as a rational number in reduced form. What is the numerator of this fraction?

(A) 999 (B) 648 (C) 37 (D) 24 (E) None of the above

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21. The value of $(((2^2)^2)^2)^2$ is?

(A) 256 (B) 512 (C) 65536 (D) 262144 (E) None of the above

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22. Find the factored form of the quadratic

$$(x+1)(x-625) + (x+5)(x-125) + (x-5)(x+125) + (x+625)(x-1).$$

(A) $4(x-25)(x+25)$ (B) $1488x$ (C) $4x(x+625)$
(D) $x(x+625)$ (E) None of the above

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23. Find the numerator of the fraction obtained by writing the rational number $\dfrac{1}{2010} + \dfrac{1}{2013}$ in reduced form.

(A) 4023 (B) 149 (C) 449570 (D) 1341 (E) None of the above

ANSWERS:

1. B
2. C
3. C
4. C
5. E
6. E
7. A
8. E
9. D
10. A
11. A
12. C
13. C
14. B
15. D
16. E
17. C
18. C
19. A
20. D
21. C
22. A
23. E