Higher Algebra Test

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1. A student travels from her home to her school by running 1/3 of the way, jogging half the way, and then walking the last 3 miles. How far is it from her home to the school?

    (A) 8 mi (B) 18 mi (C) 36 mi (D) 64 mi (E) None of the above

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2. What is the distance between the points $(1, 4)$ and $(-1, 2)$ in the rectangular coordinate plane?

    (A) 8   (B) 6   (C) $\sqrt{5}$ (D) $2\sqrt{2}$ (E) None of the above

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3. All of the solutions to the equation $x^2 = 36$ are:

    (A) $x = \sqrt{6}$ (B) $x = 6$ (C) $x = 0$ and $x = 6$ (D) $x = 6$ and $x = -6$
    (E) None of the above

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4. Which of the following is **NOT** equal to $\frac{2}{5} + \frac{3}{12}$?

    (A) $\frac{1}{10} + \frac{11}{20}$ (B) $\frac{1}{2} + \frac{3}{20}$ (C) $\frac{5}{4} - \frac{3}{5}$ (D) $\frac{1}{3} + \frac{19}{60}$ (E) None of the above

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5. What is the smallest integer that is divisible by 6 different primes?

   (A) 64   (B) 20790   (C) 30030   (D) 1 million   (E) None of the above

6. The number $\dfrac{36}{\sqrt{31}+\sqrt{19}}$ can be simplified to:

   (A) $3(\sqrt{31}-\sqrt{19})$ (B) $18\sqrt{2}/5$ (C) $6\sqrt{3}$ (D) $2\sqrt{3}$ (E) None of the above

7. How many distinct real number solutions does the equation

$$x^2(2x+3)(x^2+4)(x^2+2x-15)(x^2+3x-18)^2(x^2+3x+18)=0$$

   have?

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

8. How many times do the graphs of the equations $(x-2)^2+(y+1)^2=4$ and $y=2x+1$ intersect in the rectangular-coordinate plane?

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

9. An integer N is written in base 5 as $N=2401$. What is the base 3 expression for N?

   (A) 200000   (B) 11111   (C) 10021221   (D) 111000   (E) None of the above.

10. Which of the following equations expresses the *commutative law for addition?*

(A) $a + b = b + a$ (B) $(a + b) + c = a + (b + c)$ (C) $a(b + c) = ab + ac$
(D) $a(bc) = (ab)c$ (E) None of the above

11. How many integers between 1 and 1000 inclusive are divisble by 3 but not divisible by 15?

(A) 267   (B) 333   (C) 67   (D) 133   (E) None of the above

12. Let N be the smallest integer for which the number of integers between 1 and N inclusive which are divisble by 3 but not by 15 is equal to 100. What is N?

(A) 375   (B) 747   (C) 372   (D) 500   (E) None of the above

13. Let x and y be numbers which satisfy the equations: $x - 2y = 1$ and $2y + 3x = 74$. What must x equal?

(A) 5/2   (B) 202/7   (C) 23   (D) 94   (E) None of the above

14. The graph of $y = -x^2 + 4x + 21$ in the rectangular coordinate plane does **NOT** pass through which of the four quadrants?

(A) I   (B) II   (C) III   (D) IV   (E) None of the above.

15. Given that $f(x) = x^2$ and $g(x) = 5x - 3$ determine $f(g(x)) - g(f(x))$.

(A) 0   (B) $x^2 - 5x + 3$ (C) $20x^2 - 30x + 12$ (D) $25x^2 - 30x + 9$
(E) None of the above.

16. If $P(x)$ is a polynomial of degree 4 and $Q(x)$ is a polynomial of degree 3 then $P(Q(x))$ is a polynomial, what is its degree?

(A) 12   (B) 7   (C) 0   (D) It can't be determined without more information.
(E) None of the above.

17. In 45 minutes a jogger runs a distance of three and one third miles. What is the jogger's average rate of speed in miles per hour?

(A) $4.\overline{3}$ mph (B) $4.\overline{4}$ mph (C) 4.5 mph (D) $4.\overline{6}$ mph (E) None of the above

18. The quadratic polynomial $10x^2 + 25x - 15$ factors as:

(A) $5(2x - 1)(x + 3)$ (B) $(2x - 1)(x + 3)$ (C) $5(1 - 2x)(x + 3)$
(D) $5(2x - 3)(x + 1)$ (E) None of the above

19. Let n be a positive number and let $z = (n^{1/3})^2 n^{-4}\sqrt{n\sqrt[3]{n}}$. Find $\log_n(z)$.

(A) $-5/2$ (B) $-8/3$ (C) $1/3$ (D) $5/2$ (E) None of the above.

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20. If $x = 3.0001$ what whole number is nearest to the value of $\dfrac{x^3 + 2x^2 - 8x - 21}{x - 3}$?

   (A) 0   (B) 14   (C) 31   (D) ∞ (E) None of the above

21. Consider an equation of the form $2x^2 + bx + c = 0$ where b and c are constants. If the sum of the two solutions of this equation is 5 and their product is 6 then what must c equal?

   (A) -5 (B) 3   (C) 6   (D) 12   (E) None of the above

22. Among the five rational numbers $\frac{5}{11}$, $\frac{4}{13}$, $\frac{5}{12}$, $\frac{6}{19}$ and $\frac{4}{12}$ which is the smallest?

   (A) $\frac{5}{11}$ (B) $\frac{4}{13}$ (C) $\frac{5}{12}$ (D) $\frac{6}{19}$ (E) $\frac{4}{12}$

23. The graph of the equation $|x| - |y| = 1$ is a:

   (A) ray   (B) straight line   (C) circle   (D) square   (E) None of the above

24. What is the smallest integer N for which $\left(\dfrac{3}{5}\right)^N$ is smaller than $\dfrac{1}{5}$?

   (A) $N = -1$ (B) $N = 3$ (C) $N = 4$ (D) There is no such integer N.
   (E) None of the above