Higher Algebra Test

1. Find the simplest radical form of $5\sqrt{10}\sqrt{35}\sqrt{2}$

   (A) $50\sqrt{7}$ (B) $50\sqrt{10}$ (C) $10\sqrt{35}$ (D) $14\sqrt{10}$ (E) None of the above

2. The reciprocal of $\dfrac{1}{5} + \dfrac{1}{9} + \dfrac{1}{2}$ is

   (A) $90/73$ (B) 16 (C) $5/4$ (D) $37/45$ (E) None of the above

3. Which of these numbers is largest?

   (A) $(1/7)^{100}$ (B) $(1/7)^{10}$ (C) $1/7$ (D) $(1/7)^{-10}$ (E) $(1/7)^{-100}$

4. The expansion of $(1 + 2x)^3$ is

   (A) $1 + 6x + 6x^2 + 2x^3$ (B) $1 + 3x + 3x^2 + 8x^3$ (C) $1 + 6x + 12x^3 + 8x^3$
   (D) $1 + 5x + 8x^2 + 4x^3$ (E) None of the above

5. How many distinct real number solutions does the equation

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

   have?

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

6. In simplest form $4(x^3 - x^2 + 2) + 2(x^2 - x - 6) - (3x^3 + 2x^2 - x)$ equals

   (A) $7x^3 - 3x - 4$ (B) $x^3 - 4x^2 - x - 6$ (C) $x^3 - 3x - 4$

         (D) $x^3 - 4x^2 - 9$ (E) None of the above

7. The solution to the system of equations $\begin{cases} 5x + 4y & = 8 \\ x - 2y & = 10 \end{cases}$ is $(x, y) =$

   (A) $(0, 2)$ (B) $(3, -7/4)$ (C) $(2, -4)$ (D) $(4, -3)$ (E) None of the above

8. Let ℓ be the line whose equation is $y = -x + 2$. Where does the point $P(4, -2)$ lie?

   (A) below ℓ (B) on ℓ (C) above ℓ (D) All of the above   (E) None of the above

9. Let ℓ be the line whose equation is $y = -x + 2$. Where does the point $Q(-1, 4)$ lie?

   (A) below ℓ (B) on ℓ (C) above ℓ (D) All of the above   (E) None of the above

10. Which of the following is **NOT** equal to $\frac{2}{3} + \frac{1}{4}$?

   (A) $\frac{4}{6} + \frac{1}{4}$ (B) $\frac{7}{12} + \frac{4}{12}$ (C) $\frac{1}{7} + \frac{2}{7}$ (D) $1 - \frac{1}{12}$ (E) $\frac{1}{6} + \frac{3}{4}$

11. The product of three consecutive positive integers is 120. What is their sum?

   (A) 15   (B) 5   (C) 20   (D) 12   (E) None of the above

12. If $1/3$ is halfway between $1/7$ and x on a number line then x equals

   (A) 2/21   (B) 5/21   (C) 11/21   (D) 17/21   (E) None of the above

13. If $6x^2 + 19x - 7 = (Ax + B)(Cx + D)$ then the value of $A + C - B - D$ is

   (A) -1 (B) 0   (C) 18   (D) 7   (E) None of the above

14. All of the solutions to the equation $\sqrt{y^2} = 121$ are

   (A) $y = \pm 121$ (B) $y = 14641$ (C) $y = \pm 11$ (D) $y = 11$ (E) None of the above

15. The smallest positive integer n for which there are 4 primes between n^2 and $(n + 1)^2$ is

   (A) $n = 4$ (B) $n = 5$ (C) $n = 6$ (D) $n = 7$ (E) None of the above

16. Which of the following is the fractional form of the repeating decimal $.\overline{21}$?

   (A) 7/33   (B) 11/50   (C) 1/300   (D) 21/100   (E) None of the above

17. All of the solutions to the equation $x + 1 = \dfrac{4 + x}{x}$ are

    (A) $x = 2$ (B) $x = 0$ (C) $x = 2$ and $x = -2$

        (D) $x = -4$ and $x = 2$ (E) None of the above

18. How many integer solutions does the inequality $|2x - 5| < 7$ have?

    (A) 0   (B) 2   (C) 4   (D) 6   (E) None of the above

19. If $a = 10.0001$ then what is the integer closest to the value of $\dfrac{2a^2 - 17a - 30}{10 - a}$?

    (A) -10021 (B) -23 (C) -20 (D) -2 (E) None of the above

20. If $f(x) = x + A$ for some constant A and $f(f(f(1))) = 6$ then the value of A is:

    (A) 5   (B) 5/3   (C) 2   (D) 2009   (E) None of the above

21. What is the remainder when

$$1! + 2! + 3! + 4! + \cdots + 2008! + 2009!$$

is divided by 10? (The factorial $n!$ of a positive integer n is the product of all positive integers less than or equal to n, that is $n! = 1 \cdot 2 \cdot 3 \cdot 4 \cdots (n - 1) \cdot n$.)

    (A) 0   (B) 1   (C) 3   (D) 9   (E) None of the above