1. When expressed in simplest radical form, $\left(\sqrt[3]{9}\right)\left(\sqrt[4]{16}\right)\left(\sqrt[6]{36}\right)$ is $a\sqrt[b]{c}$, where a, b, and c are natural numbers. Find the sum of $a + b + c$.

    A. 11   B. 17   C. 23   D. 59   E. NOTA

2. $f(x)$ and $g(x)$ are linear functions which intersect at the point (5, 1). What is the point of intersection of the graphs of $f(x + 3)$ and $g(x + 3)$?

    A. (8, 4)   B. (5, 4)

    C. (2, 1)   D. unable to be determined   E. NOTA

3. Simplify and assume non-zero denominators: $$\cfrac{1}{1-\cfrac{1}{1-\cfrac{1}{1-x}}}$$

    A. $1 - x$ B. 1   C. $x - 1$ D. -1   E. NOTA

4. If n is a positive integer and $i = \sqrt{-1}$, which of the following statements is false?

    A. $i^{4n} = 1$ B. $i^{n+4} = i^n$ C. $i^{4n+1} = -i$ D. $i^{4n+2} = -1$ E. NOTA

5. When solved over {Complex Numbers}, the equation $x + \sqrt{x-4} = 6$ has:

    A. two distinct real roots   B. exactly one real root

    C. Two distinct imaginary roots   D. exactly one imaginary root   E. NOTA

6. A function f is defined recursively as follows:
    $$f(n) = 1$$
    $$f(n) = f(n-1) + n \quad (\text{for } n > 1)$$

    Find the value of $f(4) + f(5)$.

    A. 18   B. 23   C. 25   D. 36   E. NOTA

7. Which of the following is not a possible rational root of the equation $9x^3 + ax^2 + bx + 18 = 0$, where a and b are integers?

    A. $\dfrac{1}{9}$ B. -6   C. $\dfrac{2}{3}$ D. $\dfrac{3}{2}$ E. NOTA

8. The probability that Mark will pass calculus is 0.3 and the probability that he will pass physics is 0.6. What is the probability that he will pass at least one of these classes?

    A. 0.09   B. 0.18   C. 0.9   D. 0.72   E. NOTA

9. If the units digit of 2^{2006} is X and the units digit of 7^{2006} is Y, find the product XY.

    A. 6　　　　　　B. 14　　　　　　C. 24　　　　　　D. 36　　　　　　E. NOTA

10. Given: W varies directly as X and inversely as the square of Y. If both the value of X and the value of Y are increased by 25%, what change takes place in W?

    A. W increases by 25%　　　　　　　　B. W decreases by 25%
    C. W decreases by 20%　　　　　　　　D. W decreases by 45%　　　　　　　　E. NOTA

11. Simplify: $2^{-n} \bullet 8^{n-1} \bullet 4^{n+3} \div 16^{n}$

    A. 8　　　　　　B. 2^{3n}　　　　　　C. 4　　　　　　D. 4^{n}　　　　　　E. NOTA

12. For $a, b \neq 0$, find the value of k for which the line containing $\left(\dfrac{1}{a}, k\right)$ and $\left(\dfrac{1}{b}, \dfrac{b}{a}\right)$ is perpendicular

    to the line containing $(0, 0)$ and $(b, 1)$.

    A. $\dfrac{b}{2a}$　　　　　B. $\dfrac{2b}{a}$　　　　　C. $\dfrac{2b}{a}+1$　　　　　D. 1　　　　　E. NOTA

13. In $\triangle ABC$, $AB = 12$, $BC = 16$, $AC = 14$, point D is on $\overline{AC}$, and $\overline{BD}$ bisects $\angle B$. Find AD.

    A. 8　　　　　　B. 7　　　　　　C. 6　　　　　　D. 4　　　　　　E. NOTA

14. If $\left(3 \log_{p} x\right)\left(\log_{4} p\right) = 6$ $(p > 0, p \neq 1, x > 0)$, find the value of x.

    A. 4　　　　　　B. 16　　　　　　C. 4p　　　　　　D. 2　　　　　　E. NOTA

15. Find the value of $A + B + C$, if A is the positive root of $x^3 + x^2 - 9x - 9 = 0$, B is the sum of the roots

    of $\dfrac{12}{x-1} - \dfrac{8}{x} = 2$ and C is the product of the roots of $(x^2 - 1)^2 - 5(x^2 - 1) + 4 = 0$.

    A. 5　　　　　　B. 10　　　　　　C. 12　　　　　　D. 16　　　　　　E. NOTA

16. A club has 14 members, consisting of 6 men and 8 women. How many slates of three officers – president, vice-president, secretary – are possible if the president must be a woman and the vice-president must be a man?

    A. 2184　　　　　　B. 672　　　　　　C. 576　　　　　　D. 336　　　　　　E. NOTA

17. If the roots of $x^2 + bx + c = 0$ are the squares of the roots of $x^2 + 4x + 5 = 0$, find the sum $b + c$.

    A. 11　　　　　　B. 19　　　　　　C. 31　　　　　　D. 41　　　　　　E. NOTA

18. The perpendicular distance between the graphs of the lines $y = -x + 10$ and $y = -x + 7$ is

A. $\dfrac{3\sqrt{2}}{2}$ B. 3 C. 3.2 D. $\dfrac{7\sqrt{2}}{2}$ E. NOTA

19. Find the numerical value of 2^x, where $x = \dfrac{{}_9P_2}{\begin{vmatrix} 4 & 2 \\ 10 & 5 \end{vmatrix} + {}_4C_2 + 3!}$.

A. 4 B. 6 C. 32 D. 64 E. NOTA

20. Find the sum of all distinct real values of x that satisfy $\left(x^2 - 9x + 19\right)^{\left(x^2 + 2x - 3\right)} = 1$.

A. 16 B. 12 C. 9 D. 7 E. NOTA

21. Given $3x + 2yi = -9i(6 - 7i)$, where x and y are real numbers and $i = \sqrt{-1}$. Find the sum $x + y$.

A. -117 B. -48 C. -6 D. 13.5 E. NOTA

22. An equation of the parabola with directrix $x = -1$ and focus $(3, 2)$ is

A. $y^2 - 8x - 4y + 12 = 0$ B. $y^2 - 8x + 1 = 0$
C. $x^2 - 2x - 8y + 17 = 0$ D. $x^2 - 4x + 8y + 12 = 0$ E. NOTA

23. The first and second terms of a geometric sequence are q^{-4} and q^p, respectively, $(q > 0)$. If q^{52} is the eighth term of the sequence, find the value of p.

A. 8 B. $\dfrac{24}{7}$ C. 4 D. 12 E. NOTA

24. The quadratic equation $kx^2 + 8x + 4 = 1$ will have two imaginary roots if

A. $k > 4$ B. $k > \dfrac{16}{3}$ C. $k > -4, k \neq 0$ D. $k < \dfrac{16}{3}, k \neq 0$ E. NOTA

25. Which of the following are true of the function $f(x) = ln\ x$?

    i)   The domain of f is $\{x: x > 0, x \neq 1\}$
    ii) f is a strictly decreasing function.
    iii) $f^{-1}(x) = e^x$
    iv)   The range of f is $\{Real\ Numbers\}$
    v) f is a one – to – one function.

    A. i, iii, iv only   B. iii, iv only   C. iii, iv, v only   D. i, ii, iii, iv, v   E. NOTA

26. The ratio of an interior angle to an exterior angle of a certain regular polygon is 5 : 1.
Find the sum of the interior angles of the polygon.

    A. 120   B. 360   C. 1650   D. 1800   E. NOTA

27. Find the sum of the y-coordinates of the foci of the graph of $25x^2 + 9y^2 - 50x + 36y - 164 = 0$.

    A. 1   B. -4 C. -2 D. 2   E. NOTA

28. If $\displaystyle\sum_{x=1}^{3}(ax + b) = 15$ and $\displaystyle\sum_{x=2}^{4}(ax + b) = 21$, find the sum $a + b$.

    A. 1   B. 36   C. 3   D. 18   E. NOTA

29. Given $f(x) = x^4 + 5x^2 + 2x - 11$. According to DesCartes' Rule of Signs, if A is the maximum number of positive real zeros possible for $f(x)$ and B is the maximum number of negative real zeros possible for $f(x)$, find $A - B$.

    A. -2 B. -1 C. 0   D. 1   E. NOTA

30. Consider the graph of $f(x) = \dfrac{x^2 - 2x - 15}{x^2 + x - 6}$. How many of the following statements are true?

    i)   The graph has two vertical asymptotes.
    ii) The graph has no points in quadrant III.
    iii) The graph has a horizontal asymptote with equation $y = 0$.
    iv) The graph has one real zero.

    A. 0   B. 1   C. 2   D. 3   E. NOTA