1. Which of the following is equivalent to $\left(4^{\sqrt{2}}\right)^{\sqrt{3}} = x$?

   A. $\log_2 x = 24^{\frac{1}{2}}$ B. $\log_4 x = \sqrt{5}$ C. $\log_4 \sqrt{5} = x$ D. $\log_2 \sqrt{6} = x$ E. NOTA

2. The midpoint of the line between $(4,-7)$ and $(10,21)$ is (h,k). If a right triangle has legs of length $|h|$ and $|k|$, what is the length of the hypotenuse?

   A. $2\sqrt{205}$ B. $\frac{485}{2}$ C. $7\sqrt{2}$ D. $14\sqrt{2}$ E. NOTA

3. The *x*-intercepts of $f(x) = \frac{2x-3}{x^2-9}$ is/are:

   A. $3,-3$ B. 1.5 C. $1 \pm \sqrt{7}$ D. There are no *x*-intercepts E. NOTA

4. Find the sum of the abscissa and the ordinate of the solution to $\begin{cases} \frac{1}{x} + \frac{1}{y} = \frac{7}{12} \\ xy = 12 \end{cases}$.

   A. 13 B. 8 C. 7 D. $\frac{49}{2}$ E. NOTA

5. A spherical balloon has a circumference of 10 inches. If it expands so that its surface area is doubled, what happens to its volume?
   A. Its volume doubles.
   B. Its volume more than doubles.
   C. Its volume increases but does not double.
   D. The volume does not change.
   E. NOTA

6. How many integers are solutions to $2 \le |x-4| \le 8$?

   A. 10 B. 17 C. 7 D. Infinitely many E. NOTA

7. If $h(x) = f(g(x)) = \frac{1}{x^2-4}$, which of the following could be functions *f* and *g*?

   A. $f(x) = \frac{1}{x^2}, g(x) = x-4$ B. $f(x) = \frac{1}{x^2}, g(x) = -\frac{1}{4}$

   C. $f(x) = x^2 - 4, g(x) = \frac{1}{x}$ D. $f(x) = \frac{1}{x}, g(x) = x^2 - 4$

   E. NOTA

8. Let $A=\dfrac{10}{3+\dfrac{10}{3+\dfrac{10}{3+...}}}$, $B=\sqrt{210+\sqrt{210+\sqrt{210+...}}}$, and $\dfrac{C}{D}=0.3\overline{4}$.

If C and D are relatively prime. Find the least common multiple of A, B, and D.

A. 90 B. 630 C. 30 D. 150 E. NOTA

9. Find the partial fraction decomposition for $\dfrac{x+4}{x^3-2x^2+x}$.

A. $\dfrac{4}{x}+\dfrac{-4}{x-1}+\dfrac{9}{(x-1)^2}$ B. $\dfrac{4}{x}+\dfrac{-4}{x-1}+\dfrac{5}{(x-1)^2}$

C. $\dfrac{-4}{x}+\dfrac{4}{x-1}+\dfrac{5}{(x-1)^2}$ D. $\dfrac{4}{x}+\dfrac{5}{x-1}+\dfrac{-4}{(x-1)^2}$

E. NOTA

10. Find the value of x such that the matrix $\begin{bmatrix}1 & 0 & 2\\ x & x & 4\\ 3 & 1 & 2\end{bmatrix}$ is singular.

A. -2 B. $\dfrac{2}{3}$ C. $-\dfrac{2}{5}$ D. 2 E. NOTA

11. If the sides of a triangle have measures $3x+4$, $6x-1$, and $8x+2$, find all possible values of x.

A. $x>-1$ B. $x>\dfrac{3}{11}$ C. $x>-\dfrac{7}{5}$ D. $x>0$ E. NOTA

12. Find the equation of an ellipse with foci $(-2,3)$ and $(2,3)$ and major axis of length 8.

A. $12x^2+16y^2-96y-48=0$ B. $16x^2+20y^2-120y-140=0$

C. $16x^2+12y^2-72y-36=0$ D. $20x^2+16y^2-96y-176=0$

E. NOTA

13. Find the area bounded by the graphs of $\begin{cases}y\ge-|x+2|\\ x\le 0\\ y\le 0\end{cases}$

A. 2 B. 6 C. 4 D. area is unbounded E. NOTA

14. When an object moves on a circular path, the centripetal force varies directly as the square of the velocity and inversely as the radius of the curve. If the force is 600 lb for a velocity of 15 mph and radius 3, find the force of a velocity of 25 mph and radius 4.

A. 480 lb B. 900 lb C. 1050 lb D. 1250 lb E. NOTA

15. A cyclist travels a 70-mile round trip in a 5 mph wind. Find the average rate of speed for the trip if the cyclist can travel 15 mph with no wind.

A. 3.5 mph B. 13.4 mph C. 1.75 mph D. 13.3 mph E. NOTA

16. The average (mean) of the integer solutions to $\sqrt{4x+7} \le 4$ is:

A. 0.5 B. 1 C. 1.5
D. There are infinitely many solutions for *x*, therefore no average can be found E. NOTA

17. The solution set to $-4x^2+17x+15 \le 0$ is $(-\infty, c] \cup [d, \infty)$. If $[x]$ denotes the greatest integer function, Find $[c]$.

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

18. Find the sum of all possible values of *x* such that $\left(x^2-6x+4\right)^2 = 16$.

A. 0 B. 6 C. 10 D. 36 E. NOTA

19. The greatest solution to $\frac{x^2-4}{x^2-1} \le \frac{x}{x+3}$ can best be described as a:

A. positive rational number greater than B. positive irrational number greater than 3
C. positive rational number less than D. positive irrational number less than 3
E. NOTA

20. Use common logarithms to solve $2^{x+3} = 3^{2x-1}$ for *x*.

A. $\log 24$ B. $\frac{\log 24}{\log\left(\frac{9}{2}\right)}$ C. $\frac{\log 11}{\log 7}$ D. $\log\left(\frac{16}{3}\right)$ E. NOTA

21. If $3^x 4^y = 15{,}552$, find $x+y$.

A. 6 B. 7 C. 8 D. 9 E. NOTA

22. Find the number of nonnegative integer solutions to $3^{5x} \cdot 81^{-x} \ge 9^{x^2-3}$.

A. 1 B. 2 C. 3 D. 4 E. NOTA

23. A formula for determining the day of the week for any day after 1752 is $w = d + 2m + \left[\frac{3(m+1)}{5}\right] + y + \left[\frac{y}{4}\right] - \left[\frac{y}{100}\right] + \left[\frac{y}{400}\right] + 2$, where *d* represents the day of the month, *y* represents the number of the year, *m* represents the number of the month, and $[x]$ represents the greatest integer function. The months March through December are numbered 3 through 12; but January and February must be considered as the 13th and 14th months of the previous year, so they are numbered 13 and 14, respectively. As a result, when using the formula for a date in January or February, the value of *y* must be the number of the previous year. Once you find *w*, divide by 7. The remainder will be the day of the week, beginning with 1 = Sunday, 2 = Monday, etc. Saturday will be 0.

Using the formula, find the day of the week for March 17, 1973.

A. Sunday B. Monday C. Friday D. Saturday E. NOTA

24. Find the equation for the slant (oblique) asymptote for $f(x) = \frac{x^2 - 11x + 30}{x - 4}$.

A. $y = x - 4$ B. $y = x - 7$ C. $y = x^2 - 11x + 30$ D. $y = x + 7$ E. NOTA

25. According to the Rational Root Theorem, which of the following is not a possible rational root of $f(x) = 16x^4 - 13x^3 + 8x^2 - 4x + 32$?

A. 4 B. $-\frac{1}{2}$ C. $\frac{1}{8}$ D. 32 E. NOTA

26. Find the distance between $y = \frac{1}{2}x + 7$ and $2y = x + 6$.

A. $\frac{8\sqrt{5}}{5}$ B. 4 C. $\frac{8\sqrt{3}}{5}$ D. $\frac{2\sqrt{5}}{5}$ E. NOTA

27. Find the slope of a line perpendicular to $3y + 9 = -2x$.

A. $\frac{2}{3}$ B. $-\frac{2}{3}$ C. $\frac{3}{2}$ D. $-\frac{3}{2}$ E. NOTA

28. Find $f(x+1) - f(x)$ if $f(x) = |3x + 1| - 5$.

A. 3 B. –5 C. $|3x + 4| - |3x + 1| - 10$ D. $|3x + 4| - |3x + 1|$ E. NOTA

29. Find the inverse of $f(x) = \sqrt{2x - 1}$.

A. $f^{-1}(x) = \frac{1}{2}\left(x^2 + 1\right)$ B. $f^{-1}(x) = x^2 + 1$ C. $f^{-1}(x) = \sqrt{2y - 1}$

D. $f^{-1}(x) = \frac{1}{\sqrt{2x - 1}}$ E. NOTA

30. If *n* is the number of distinct ordered pairs (b, c) such that $4x + by + c = 0$ and $cx - 7y + 16 = 0$ have the same graph, then *n* is:

A. 0 B. 1 C. 2 D. finite but more than 2 E. NOTA