Algebra II Individual REGIONAL COMPETITION Feb 1992

1. Let $A = \left\{-3, -\sqrt{3}, 0, \frac{1}{3}, \frac{33}{100}, 3\right\}$

Which number(s) in set A are irrational numbers?

A. All B. $\frac{1}{3}, \frac{33}{100}$ C. $-\sqrt{3}$ D. All except $-\sqrt{3}$

E. NONE OF THE ABOVE

2. SIMPLIFY: $\dfrac{80 - 3\left[2^3 - \left[-4 - (-1)\right] + 3^2\right]}{-8 \div 4 \times 2}$

A. -5 B. -20 C. $\frac{-11}{4}$ D. -395

E. NONE OF THE ABOVE

3. John drove 50 miles from home to work driving 45 mph. He returned on the same road traveling 35 mph. What was his average rate?

A. $39\frac{3}{8}$ B. 40 C. $43\frac{1}{3}$ D. 45

E. NONE OF THE ABOVE

4. SOLVE for x: $\dfrac{4}{x - 3} < 2$

A. $x < 5$ B. $3 < x < 5$ C. $x < 3$ or $x > 5$

D. $x > 5$ E. NONE OF THE ABOVE

5. SOLVE for x: $|x + 2| \geq |2x - 1|$

A. $x \geq \frac{-1}{3}$ B. $-2 \leq x \leq \frac{1}{2}$ C. $\frac{-1}{3} \leq x \leq 3$

D. $\frac{1}{2} \leq x \leq 3$ E. NONE OF THE ABOVE

6. List the range of the function $y = \frac{x + 1}{|x + 1|}$.

When the domain is all real numbers except -1.

A. $R = \{\text{all Real numbers except } 0\}$

B. $R = \{\text{Real numbers}\}$ C. $R = \{1\}$

D. $R = \{-1, 1\}$ E. NONE OF THE ABOVE

7. Find the slope for the linear equation $x + 7 = 0$.

A. -7 B. 0 C. $\frac{-1}{7}$ D. 7

E. NONE OF THE ABOVE

8. Write the equation of the line in standard form passing through $(-9,2)$ and vertical.

A. $y = 2$ B. $x = 9$ C. $y = -9$ D. $x = -9$

E. NONE OF THE ABOVE

9. Write the equation of the line in slope-intercept form passing through the intersection of $2x + y = 5$ and $x - 2y = 0$, and perpendicular to $2x - 3y = 5$.

A. $y = \frac{-3}{2}x + 4$ B. $y = \frac{2}{3}x - \frac{1}{3}$ C. $y = \frac{2}{3}x - \frac{2}{3}$

D. $y = \frac{3}{2}x - 2$ E. NONE OF THE ABOVE

10. For the function $4x - y = 7$, find the equation of the inverse.

A. Not one-to-one B. $f^{-1}(x) = \frac{x + 7}{4}$

C. $f^{-1}(x) = 4x + 7$ D. $f^{-1}(x) = \frac{x - 7}{4}$

E. NONE OF THE ABOVE

11. If $f(x) = x^2 - 1$, find $f(x + 2)$.

A. -3 or -1 B. $x^2 + 1$ C. $x^2 + 2$

D. $x^2 + 4x + 3$ E. NONE OF THE ABOVE

12. Find all values that make $\dfrac{x - 11}{2x^2 + 5x - 42}$ undefined.

A. 11 B. $\frac{7}{2}$ and -6 C. $\frac{2}{7}$ and -6 D. $\frac{-7}{2}$ and 6

E. NONE OF THE ABOVE

13. DIVIDE:

$$\frac{q^2 - 36}{q^2 - 6q} \div \frac{3q^2 - 18q}{q^3 - 6q^2}$$

A. $\dfrac{q + 6}{3}$ B. $\dfrac{q^3 - 6q^2 - 36q + 216}{q^5 - 12q^4 + 36q^3}$ C. $\dfrac{3}{q - 6}$

D. $\dfrac{q - 6}{3}$ E. NONE OF THE ABOVE

14. SOLVE for x: $x = \cfrac{1}{4 + \cfrac{1}{2 + \cfrac{1}{4 + \cfrac{1}{2 + \ldots}}}}$

A. $\dfrac{-2 \pm \sqrt{6}}{2}$ B. $\dfrac{-2 + \sqrt{6}}{2}$ C. $\frac{2}{9}$ D. $\frac{9}{40}$

E. NONE OF THE ABOVE

15. SOLVE the formula for k: $g = hk(2 - k)$

A. $k = \dfrac{2h \pm \sqrt{2h^2 - 4hg}}{2h}$ B. $k = \dfrac{h \pm \sqrt{h^2 - hg}}{h}$

C. $k = \dfrac{-h \pm \sqrt{h^2 - hg}}{h}$ D. $k = \dfrac{g}{h} - 2$

E. NONE OF THE ABOVE

16. Given $x + y = 11$ and $x^2 + y^2 = 73$, find $x^3 + y^3$.

A. 84 B. 341 C. 539 D. 803

E. NONE OF THE ABOVE

17. SOLVE: $\dfrac{6}{x} + \dfrac{7}{y} = 1$

$\dfrac{-3}{x} - \dfrac{3}{y} = 6$

A. $\left(\dfrac{1}{11}, \dfrac{1}{13}\right)$ B. $\left(\dfrac{-1}{13}, \dfrac{-1}{11}\right)$ C. $\left(\dfrac{-1}{11}, \dfrac{-1}{13}\right)$ D. $\left(\dfrac{1}{13}, \dfrac{1}{11}\right)$

E. NONE OF THE ABOVE

18. Given $\begin{aligned} x - 2y - z &= 0 \\ x + 2y + z &= 6 \\ 2y - z &= 5 \end{aligned}$

Find $x + y + z$

A. -1 B. 2 C. 3 D. 4

E. NONE OF THE ABOVE

19. Given $D = \begin{vmatrix} 3 & -1 \\ 8 & -2 \end{vmatrix}$ $D_x = \begin{vmatrix} 4 & -1 \\ -1 & -2 \end{vmatrix}$, and $D_y = \begin{vmatrix} 3 & 4 \\ 8 & -1 \end{vmatrix}$.

Use Cramer's rule to solve the system.

A. $\left(\dfrac{-9}{2}, \dfrac{-35}{2}\right)$ B. $\left(\dfrac{7}{2}, \dfrac{-35}{2}\right)$ C. $\left(\dfrac{9}{14}, \dfrac{5}{2}\right)$ D. $\left(\dfrac{-9}{2}, 14\right)$

E. NONE OF THE ABOVE

20. An investor decides to invest \$10,000 in two accounts, one of which pays 8% simple interest and the other 12%. If the investor wishes to earn 11% on the total amount, how much should he invest at 12%?

A. \$7,500 B. \$2,500 C. \$1,100 D. \$900

E. NONE OF THE ABOVE

21. For $x^3 - 2x^2 - 5x + 6 = 0$, find the sum of the reciprocals of the roots.

A. $\frac{1}{3}$ B. $\frac{5}{6}$ C. 2 D. 6

E. NONE OF THE ABOVE

22. MULTIPLY: $x^{\frac{1}{2}}\left(x^{\frac{1}{2}} + x^{\frac{3}{2}}\right)$

A. $x^{\frac{1}{4}} + x^{\frac{3}{4}}$ B. $x^{\frac{5}{2}}$ C. x^3 D. $\frac{1}{x^3}$

E. NONE OF THE ABOVE

23. SIMPLIFY: $\sqrt[6]{27} - \sqrt[4]{9}$

A. $\sqrt{18}$ B. $\sqrt{3}$ C. 0 D. 1

E. NONE OF THE ABOVE

24. If $\sqrt{x} + i\sqrt{y} = \sqrt{9 + 4\sqrt{5}\,i}$, find $x - y$.

A. 5 B. 9 C. $9 + 4\sqrt{5}$ D. 20

E. NONE OF THE ABOVE

25. SOLVE for x: $\left[\log_2 x\right]^2 - \log_2 x = \log_2 64$

A. 8 or $\frac{1}{4}$ B. 3 or -2 C. $\frac{1}{8}$ or 4 D. 3

E. NONE OF THE ABOVE

26. SIMPLIFY: $8i^8 + 10i^{12} + 12i^{14} - 6i^{27}$

A. $-6 + 6i$ B. $6 - 6i$ C. $6 + 6i$ D. $30 - 6i$

E. NONE OF THE ABOVE

27. Find $|3 - 2i| =$

A. $\sqrt{5}$ B. $\sqrt{13}$ C. 5 D. $3 + 2i$

E. NONE OF THE ABOVE

28. Determine the graph of $x^2 - 4x - y^2 - 2y + 3 = 0$.

A. Two lines B. Hyperbola C. Circle D. Ellipse

E. NONE OF THE ABOVE

29. Find the length of the major axis for
$4x^2 - 16x + 9y^2 + 54y + 61 = 0$.

A. $\sqrt{5}$ B. 4 C. 6 D. 9

E. NONE OF THE ABOVE

30. Write the equation of the parabola that is a function with a vertex (1,9) passing through (0,8).

A. $y = -x^2 + 2x + 8$ B. $y = x^2 + 8$

C. $y = x^2 - 2x - 8$ D. $y = x^2 - 2x + 8$

E. NONE OF THE ABOVE