

1. Which one of the following statements is FALSE?

(a) $x^2 = 4$ and $x = 2$ are equivalent equations.

(b) The equation $\frac{x+3}{x+1} = \frac{2}{x+1}$ has no solution.

(c) $(x^2 - 4) - (x+2)(x-2) = 0$ is an identity.

(d) $(x+3)^2 = x^2 + 9$ is a conditional equation.

(e) $\frac{4x+7}{4} = x+7$ is a contradiction.

2. Identify the property of equality that is illustrated by the statement

$$\text{If } 2x - y = z \text{ and } z = 13, \text{ then } 2x - y = 13$$

(a) The transitive property

(b) The reflexive property

(c) The symmetric property

(d) The closure property

(e) The distributive property

3. The coefficient of x^2y in the expression $\left(\frac{1}{2}x - \frac{1}{3}y\right)^3$ is equal to

(a) $-\frac{1}{4}$

(b) $-\frac{3}{4}$

(c) $\frac{3}{4}$

(d) $-\frac{9}{4}$

(e) $-\frac{1}{36}$

4. If x is any nonzero real number, then one of the following statements is always TRUE:

(a) $\sqrt[3]{-x}$ is a real number

(b) $\frac{2}{x}$ is a rational number

(c) x^2 is a rational number

(d) $-x$ is a negative number

(e) $4x$ is a composite number

5. If $x < 0$, then the expression

$$\left| \frac{10 + 2x}{|x| - |2 - x|} \right|$$

simplifies to

(a) $|5 + x|$

(b) $5 - x$

(c) $\frac{5 + x}{1 - x}$

(d) $\left| \frac{5 + x}{1 - x} \right|$

(e) $x - 5$

6. If x and y are nonzero real numbers, then the expression

$$\frac{[(25)^{-1}x^4y^{-2}(xy^{-2})^0]^{-\frac{1}{2}}}{[(-125)^{-1}x^{-9}y^3]^{-\frac{1}{3}}}$$

simplifies to

(a) $-\frac{y|y|}{x^5}$

(b) $-y \left| \frac{y}{x} \right|$

(c) $-\frac{5y|y|}{x}$

(d) $-\frac{25|xy|}{x^5}$

(e) $\frac{1}{25x^5}$

7. The set of all real numbers x for which $1 < x \leq 8$ and $|2x - 5| \geq 1$ is given by the interval

(a) $(1, 2] \cup [3, 8]$

(b) $[2, 3]$

(c) $(1, 3]$

(d) $[2, 3] \cup [6, 8]$

(e) $(1, 3] \cup [6, 8]$

8. $\frac{5\sqrt{5}}{2 + \sqrt{5}} =$

(a) $5(5 - 2\sqrt{5})$

(b) $5(2 - 5\sqrt{5})$

(c) $5(5 + 2\sqrt{5})$

(d) $2 + 5\sqrt{5}$

(e) $\frac{5}{3}$

9. The sum of all solutions of the equation

$$x^{\frac{2}{3}} + 2x^{\frac{1}{3}} - 3 = 0$$

is equal to

- (a) -26
- (b) 25
- (c) -21
- (d) 29
- (e) -2
10. If P and Q are two polynomials of degree 4, then one of the following statements is TRUE:

- (a) $P + Q$ is a polynomial of degree ≤ 4
- (b) $P \cdot Q$ is a polynomial of degree 16
- (c) $\frac{1}{P}$ is a polynomial of degree -4
- (d) $\frac{P+Q}{P}$ is a polynomial of degree 4
- (e) $\frac{P}{Q}$ is a polynomial of degree 1

11. Use the discriminant to determine that the equation

$$\frac{1}{3}x^2 - \frac{1}{4}x + \frac{1}{5} = 0$$

has

- (a) two distinct nonreal complex roots
- (b) two equal positive roots
- (c) two equal negative roots
- (d) one positive root and one negative root
- (e) two equal nonreal roots

12. The expression

$$(4x - 5y)(4x + 5y) - (2x - 3y)(3x + 2y)$$

simplifies to

- (a) $10x^2 + 5xy - 19y^2$
- (b) $10x^2 + 4xy - 21y^2$
- (c) $8x^2 - 16y^2$
- (d) $10x^2 - 19y^2$
- (e) $22x^2 - 5xy - 19y^2$

13. Completing the square on $5x^2 - 30x + 49 = 0$ gives $(x + a)^2 = b$ where $a \cdot b$ is equal to

(a) $\frac{12}{5}$

(b) $\frac{36}{5}$

(c) $\frac{294}{5}$

(d) $\frac{282}{5}$

(e) $-\frac{4}{25}$

14. One factor of $y^6 - 7y^3 - 8$ is

(a) $y^2 + 2y + 4$

(b) $y^2 - 4y + 4$

(c) $y^2 - 2y + 8$

(d) $y^2 - 2y + 1$

(e) $y^2 - y - 1$

15. If $i = \sqrt{-1}$, then the expression

$$\frac{3i^{90} - 9i^{92}}{2i^{89} - 4i^{91}}$$

simplifies to

(a) $2i$

(b) i

(c) $-i$

(d) $\frac{1}{2}i$

(e) $-\frac{1}{2}i$

16. Factoring $x^2 - z^2 + 14xy + 49y^2$ gives

(a) $(x + 7y - z)(x + 7y + z)$

(b) $(x - 7y - z)(x + 7y + z)$

(c) $(x + 7y - z)(x - 7y + z)$

(d) $(x + 7y - z)^2$

(e) $(x + 7y - z)(x - 7y - z)$

17. The complex number $\frac{4+5i}{2-3i}$ written in standard form is

(a) $-\frac{7}{13} + \frac{22}{13}i$

(b) $-\frac{7}{13} - \frac{4}{13}i$

(c) $2 - \frac{5}{3}i$

(d) $-\frac{9}{13} + \frac{22}{13}i$

(e) $-\frac{1}{13} + \frac{22}{13}i$

18. If $\frac{A}{B} = \frac{y-x}{x-z}$, then x is equal to

(a) $\frac{Az + By}{A + B}$

(b) $\frac{Az - By}{A - B}$

(c) $\frac{Ay + Bz}{A + B}$

(d) $\frac{Ay - Bz}{A - B}$

(e) $\frac{A + B}{Ay + Bz}$

19. The expression

$$\frac{xy^{-1} - yx^{-1}}{x^2y^{-1} - y^2x^{-1}}$$

simplifies to

(a) $\frac{x + y}{x^2 + xy + y^2}$

(b) $\frac{1}{x + y}$

(c) $\frac{1}{x - y}$

(d) $\frac{xy}{x + y}$

(e) $\frac{xy}{x^2 - xy + y^2}$

20. The sum of all solutions of the equation

$$\frac{|x - 1| + 2}{1 + |x - 1|} - \frac{3}{2} = 0$$

is equal to

(a) 2

(b) 0

(c) 1

(d) -5

(e) -1

21. The solution set of the inequality

$$\frac{2 - x^2}{x} \leq 1$$

in interval notation is equal to

- (a) $[-2, 0) \cup [1, \infty)$
- (b) $(0, 1]$
- (c) $(-\infty, -2] \cup [1, \infty)$
- (d) $[-2, 0) \cup (0, 1]$
- (e) $(-\infty, -1] \cup [2, \infty)$
22. The length of a rectangle is 20 feet more than twice its width. If the perimeter of the rectangle is 220 feet, then the length is equal to
- (a) 80 feet
- (b) 65 feet
- (c) 105 feet
- (d) 90 feet
- (e) 70 feet

23. The expression

$$12\sqrt[3]{4} - \frac{20}{\sqrt[3]{16}}$$

simplifies to

- (a) $7\sqrt[3]{4}$
- (b) $-5\sqrt[3]{4}$
- (c) $11\sqrt[3]{4}$
- (d) $16\sqrt[3]{4}$
- (e) $-8\sqrt[3]{4}$

24. The equation

$$5 + 3x + \sqrt{5 + 3x} = 0$$

has

- (a) only one negative rational root
- (b) two negative rational roots
- (c) only one positive rational root
- (d) two positive rational roots
- (e) no real roots

25. The expression

$$\frac{5}{2x^2 + 3x - 2} - \frac{3}{2x^2 + x - 1}$$

simplifies to

(a) $\frac{1}{(x+1)(x+2)}$

(b) $\frac{2}{(2x-1)(x+1)}$

(c) $\frac{2}{(2x-1)^2(x+1)(x+2)}$

(d) $\frac{x}{(x+1)(x+2)}$

(e) $\frac{4}{(x+1)(x+2)}$