

1. Which one of the following is an irrational number?

(a) $\pi \div \frac{22}{7}$

(b) $(0.\overline{23})^2$

(c) $(\sqrt{2})(\sqrt{8})$

(d) 0.73

(e) $\sqrt{25}$

See Example 1 Page 4
& Problems 1, 2 page 15

2. If $x < -1$, then the expression $|2x| + |-4x| + ||6x||$ is equal to

(a) $-12x$

(b) $12x$

(c) $-4x$

(d) $8x$

(e) $4x$

See Problems 37 to 40 p.16

3. The expression $8 - 5[3x - 4(2x - 3)]$ is equal to

(a) $-52 + 25x$

(b) $68 + 25x$

(c) $-52 - 35x$

(d) $20 - 23x$

(e) $8 - 35x$

See example 9 p.13

Problems 105 and 106 p.17

4. The expression $\frac{2^{5/2} x^{5/6} y^{1/5}}{4x^{1/3} y^{7/10}}$ is equal to

(a) $\sqrt{\frac{2x}{y}}$

(b) $\sqrt{\frac{2y}{x}}$

(c) $\sqrt{\frac{y}{2x}}$

(d) $\sqrt{\frac{x}{2y}}$

(e) $\sqrt{2xy}$

See problems 59 to 70 p.32

5. Let x be a real number, and let $A = \{x|x \leq -1\} \cup \{x|x \geq 2\}$,
 $B = \{x|-1 \leq x \leq 3\} \cap \{x|1 < x < 5\}$. Then the set
 $A \cap B$ is equal to [Hint: Graph A and B]

- (a) $[2, 3]$
 (b) $[-1, 2] \cup [3, 5]$
 (c) $[-1, 5]$
 (d) $[-1, 1) \cup [3, 5)$
 (e) ϕ (the empty set)

See examples 5 and 6 p. 9
 Problems 19 to 30 p. 6

6. The imaginary part of the complex number $\frac{5+3i}{4-2i}$ is equal to

- (a) $\frac{11}{10}$
 (b) $-\frac{3}{2}$
 (c) $\frac{7}{10}$
 (d) $-\frac{3}{2}i$
 (e) $-\frac{7}{5}i$

see example 4 p. 70

Problems 41 to 50 p. 72

7. The **sum** of the coefficients of y^2 and y^3 in the product $(5y^3 - 3y + 4)(3y^2 - 4y + 7)$ is equal to

(a) 50

(b) 47

(c) 27

(d) -3

(e) 14

See problems 33 and 34 p. 41

8. One of the factors of $4x^3 + 4x^2y - 9xy^2 - 9y^3$ is equal to

(a) $2x - 3y$

(b) $x - y$

(c) $x - 3y$

(d) $2x + y$

(e) $2x - y$

see problems 63 to 68 p. 54

9. The complex number $(3+2\sqrt{-32})(2-3\sqrt{-8})$ in standard form is equal to

(a) $102 - (2\sqrt{2})i$

See example 3 p. 69

(b) $-90 - (2\sqrt{2})i$

See Problems 33 & 36 p. 72

(c) $-18 - (2\sqrt{2})i$

(d) $6 + 48i$

(e) $6 + 16i$

10. The expression $\frac{x^{-2} - y^{-2}}{x^{-1} - y^{-1}}$ simplifies to

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

See example 5 p. 61

See Problems 59 & 62 p. 64

(b) $\frac{x-y}{xy}$

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

(d) $\frac{y^3 - x^3}{x^3y^3}$

(e) $xy(y-x)$

$$11. \frac{5}{x^2+x} - \frac{10}{x^2-1} =$$

See example 3 p. 59

See Problems 23 to 32 A.63

$$\checkmark (a) \frac{-5}{x(x-1)}$$

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

$$(c) \frac{-6}{x(x+1)}$$

$$(d) \frac{-7}{x(x-1)(x+1)}$$

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

$$12. \frac{6x^2}{3x-6} - \frac{4x^2+4x+1}{x-2} \div \frac{2x+1}{x-3} =$$

See Problems 33 to 36 A.63

$$\checkmark (a) \frac{5x+3}{x-2}$$

$$(b) \frac{5x-2}{x-3}$$

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

$$(d) \frac{3x+5}{(x-2)(2x+1)}$$

$$(e) \frac{3x+5}{x-2}$$

13. One of the factors of $36x^3(9x^3 + 8)^3 - (9x^3 + 8)^4$ is equal to

(a) $9x^2 + 6x + 4$

(b) $9x^2 - 36x + 16$

(c) $3x^2 - 6x + 2$

(d) $27x^2 - 12x + 16$

(e) $9x^2 + 36x + 16$

See Problems 85 and 86 p. 54

14. $\sqrt[3]{32} - \frac{2}{\sqrt[3]{8}} =$

(a) $\sqrt{2}$

(b) $2\sqrt[3]{8}$

(c) $2\sqrt{2}$

(d) $3\sqrt[3]{8}$

(e) $3\sqrt{2}$

See Problems 99 to 106 p. 33

15. The number $\frac{(0.93 \times 10^8)(5.2 \times 10^{-7})}{(2.6 \times 10^{-10})(3 \times 10^{15})}$, written in scientific notation, is

(a) 6.2×10^{-5}

(b) 0.62×10^{-3}

(c) 6.2×10^{-4}

(d) 62×10^{-5}

(e) 1.3×10^{-4}

See problems 41 to 48 p.32

1. If $A = \{x|x \leq -2\} \cup \{x|x \geq 1\}$ and $B = \{x|x > -3\} \cap \{x|x < 5\}$, then the set $A \cap B$ in interval notation is equal to

(a) $(-3, -2] \cup [1, 5)$

(b) $[-2, 5)$

(c) $(-\infty, -3) \cup [1, \infty)$

(d) $(-3, 1]$

(e) the empty set ϕ

See example 6 p.9

and problems 51 to 66

3. One factor of $(x - 5)^3 + 8$ is

~~(a)~~ $x^2 - 12x + 39$

Similar to problems 61, 62 p. 54

(b) $x^2 - 12x + 19$

(c) $x^2 + 12x - 39$

(d) $x^2 + 12x + 19$

(e) $x^2 - 12x - 39$

6. The expression $2(x + y)^3 - 3(x - y)^3$ simplifies to

~~(a)~~ $-x^3 + 15x^2y - 3xy^2 + 5y^3$

Similar to problems

(b) $-x^3 - 3x^2y - 3xy^2 + 5y^3$

84 to 89 p. 43

(c) $-x^3 + 15x^2y - xy^2 + 5y^3$

(d) $-x^3 + 3x^2y - 3xy^2 + 5y^3$

(e) $-x^3 + 5y^3$

8. The expression $6 - 12 \left[-\frac{3}{4}x - \left(\frac{5}{6}x - \frac{1}{3} \right) \right]$ simplifies to

~~(a)~~ $19x + 2$

(b) $\frac{49}{6}x + \frac{19}{3}$

(c) $-x + 10$

(d) $\frac{59}{6}x - \frac{17}{3}$

(e) $19x + 10$

see example 9 p. 13

and problems 99 to 106 p. 17

9. $\frac{3}{\sqrt{5} - \sqrt{2}} - \frac{2}{2\sqrt{5} - 3\sqrt{2}} =$

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

(b) $6 + 2\sqrt{10}$

(c) $-\sqrt{5} + 6\sqrt{2}$

(d) $-6 - 2\sqrt{10}$

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

see example 9 p. 31

and problems # 107 to 112 p. 33

13. The standard form of the complex number $i^{153} + \frac{i}{1-i}$ is

~~(a)~~ $-\frac{1}{2} + \frac{3}{2}i$

(b) $\frac{1}{2} - \frac{3}{2}i$

(c) $-\frac{1}{2} - \frac{3}{2}i$

(d) $\frac{1}{2} + \frac{3}{2}i$

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

See examples 4 and 5 p. 70-71
and problems 37 to 62 p. 72

22. The expression $\frac{\sqrt[3]{x^2}\sqrt{\sqrt{x}}}{\sqrt[4]{x^3}}$ in simplest form is equal to

~~(a)~~ $\sqrt[6]{x}$

(b) $\sqrt[12]{x^5}$

(c) $\frac{1}{\sqrt{x^3}}$

(d) $\sqrt[6]{x^5}$

(e) $\sqrt[12]{x}$

An application of

$$\sqrt[n]{b^m} = b^{m/n} \quad \text{p. 26}$$

$$\text{and } \sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a} \quad \text{p. 28}$$

23. If $-5 < x < -2$, then the expression

$$||x + 5| + |x - 2| + \sqrt{x^2} + \sqrt[3]{x^3}|$$

simplifies to

~~(a)~~ 7

(b) $-2x - 3$

(c) $2x + 3$

(d) 3

(e) $2x + 7$

See problems 31 to 40 p. 16
together with $\sqrt{x^2} = |x|$.

24. If $z = 2 - 3i$, then the imaginary part of the complex number $z^2 - 3z + 5$ is equal to

~~(a)~~ -3

(b) -15

(c) 21

(d) -11

(e) 6

See p. 66 (for the real and imaginary part of a complex number) and problems 75 & 76 p. 72

19. $\frac{x^{-1} - y^{-1}}{x^{-2}y^{-2}} \div \frac{x^{-2} - y^{-2}}{x^{-3}y^{-3}} =$

~~(a)~~ $\frac{1}{x+y}$

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

(c) $\frac{y}{x+y}$

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

(e) $xy(x+y)$

See examples 4 and 5 p. 60-61 and problems 41-62 p. 63-64

25. One factor of $25y^{2m} - (x^{2n} - 2x^n + 1)$ is

~~(a)~~ $5y^m - x^n + 1$

(b) $5y^m + x^n + 1$

(c) $5y^m - x^n - 1$

(d) $5y^{2m} - x^n - 1$

(e) $5y^m + x^{2n} - 1$

See problems 94 & 95 p.54

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

If $2x - y = z$ and $z = 13$, 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

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

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) $\frac{5}{3}$

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

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) $22x^2 - 5xy - 19y^2$

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

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) $-8\sqrt[3]{4}$

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