

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

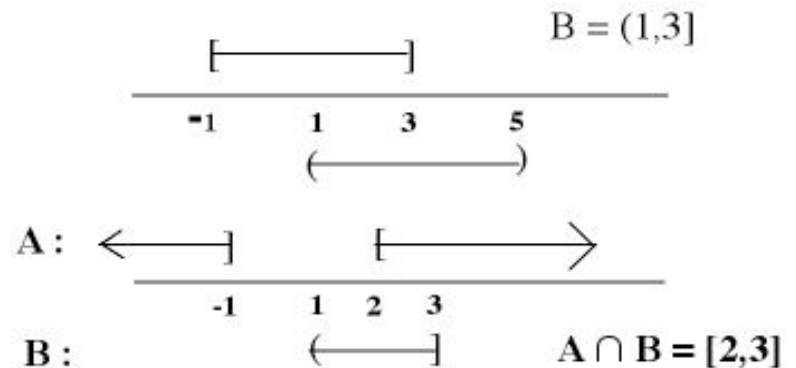
- (a) $xy(x - y)$ (b) $\frac{x - y}{xy}$ (c) $\frac{x + y}{xy}$ (d) $\frac{x^3 - y^3}{x^3 y^3}$ (e) $\frac{1}{x - y}$

Ans: $= \frac{x^{-2} - y^{-2}}{x^{-1} - y^{-1}} \cdot \frac{x^2 y^2}{x^2 y^2} = \frac{y^2 - x^2}{xy^2 - x^2 y} = \frac{(y - x)(y + x)}{xy(y - x)} = \frac{x + y}{xy}$ (c)

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

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

Ans: $B = [-1, 3] \cap (1, 5) = (1, 3]$, so $A \cap B = [2, 3]$ (b)



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

- (a) $x - y$ (b) $2x + y$ (c) $x - 3y$ (d) $2x - y$ (e) $2x - 3y$

Ans: $= (4x^3 + 4x^2y) + (-9xy^2 - 9y^3) = 4x^2(x + y) - 9y^2(x + y) = (x + y)(4x^2 - 9y^2)$
 $= (x + y)(2x + 3y)(2x - 3y)$, so one of the factors is $2x - 3y$ (e)

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

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

Ans: $= \frac{5+3i}{4-2i} \cdot \frac{4+2i}{4+2i} = \frac{(20-6) + (10+12)i}{16+4} = \frac{14}{20} + \frac{22}{20}i = \frac{7}{10} + \frac{11}{10}i.$

Therefore the imaginary part = $\frac{11}{10}$ (a)

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

- (a) $-4x$ (b) $-12x$ (c) $8x$ (d) $12x$ (e) $4x$

Ans: Notice that x is a negative real number, so $|2x| + |-4x| + ||6x||$
 $= (-2x) + (-4x) + |6x| = -6x + (-6x) = -12x$ (b)

6. 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) 47 (b) 50 (c) 27 (d) -3 (e) 14

Ans: coefficient of y^2 is $(-3)(-4) + (4)(3) = 12 + 12 = 24$ and coefficient of y^3 is
 $(5)(7) + (-3)(3) = 35 - 9 = 26$. Their sum = $24 + 26 = 50$ (b)

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

- (a) $\sqrt{25}$ (b) 0.73 (c) $(\sqrt{2})(\sqrt{8})$ (d) $(0.\overline{23})^2$ (e) $\pi \div \frac{22}{7}$

Ans: $\pi \div \frac{22}{7} = (\pi)(\frac{7}{22}) = \frac{7\pi}{22}$ is an irrational number, because $\frac{7\pi}{22}$ is not of the form $\frac{p}{q}$,
where p, q are integers and $q \neq 0$. The other numbers are rationals. (e)

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

- (a) $-18 - (2\sqrt{2})i$ (b) $6 + 16i$ (c) $-90 - (2\sqrt{2})i$ (d) $6 + 48i$ (e) $102 - (2\sqrt{2})i$

Ans: $= (3 + 2\sqrt{16}\sqrt{2}i)(2 - 3\sqrt{4}\sqrt{2}i) = (3 + 8\sqrt{2}i)(2 - 6\sqrt{2}i)$
 $= [6 - (8)(6)(2)(-1)] + [16\sqrt{2} - 18\sqrt{2}]i = 102 - 2\sqrt{2}i$ (e)

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

- (a) $-52 + 25x$ (b) $-52 - 55x$ (c) $20 - 23x$ (d) $8 - 35x$ (e) $68 + 25x$

Ans: $= 8 - 5(3x - 8x + 12) = 8 - 5(-5x + 12) = 8 + 25x - 60 = -52 + 25x$ (a)

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

- (a) $\frac{-5}{(x-1)(x+1)}$ (b) $\frac{4}{x(x-1)(x+1)}$ (c) $\frac{-7}{x(x-1)(x+1)}$ (d) $\frac{-6}{x(x+1)}$ (e) $\frac{-5}{x(x-1)}$

Ans: $= \frac{5}{x(x+1)} - \frac{10}{(x-1)(x+1)} = \frac{5(x-1) - 10x}{x(x-1)(x+1)} = \frac{5x - 5 - 10x}{x(x-1)(x+1)} = \frac{-5 - 5x}{x(x-1)(x+1)}$
 $= \frac{-5(x+1)}{x(x-1)(x+1)} = \frac{-5}{x(x-1)}$ (e)

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

- (a) $\sqrt{\frac{2y}{x}}$ (b) $\sqrt{\frac{2x}{y}}$ (c) $\sqrt{2xy}$ (d) $\sqrt{\frac{y}{2x}}$ (e) $\sqrt{\frac{x}{2y}}$

Ans: $= 2^{(\frac{5}{2}-2)} x^{(\frac{5}{6}-\frac{1}{3})} y^{(\frac{1}{5}-\frac{7}{10})} = 2^{\frac{1}{2}} x^{\frac{1}{2}} y^{-\frac{1}{2}} = (2x)^{\frac{1}{2}} y^{-\frac{1}{2}} = \left(\frac{2x}{y}\right)^{\frac{1}{2}} = \sqrt{\frac{2x}{y}}$ (b)

12. $\sqrt[4]{32} - \frac{2}{\sqrt[4]{8}} =$

- (a) $3\sqrt[4]{2}$ (b) $2\sqrt[4]{2}$ (c) $3\sqrt[4]{8}$ (d) $2\sqrt[4]{8}$ (a) $\sqrt[4]{2}$

Ans: $= \sqrt[4]{(16)(2)} - \frac{2}{\sqrt[4]{8}} \cdot \frac{\sqrt[4]{2}}{\sqrt[4]{2}} = 2\sqrt[4]{2} - \frac{2\sqrt[4]{2}}{\sqrt[4]{16}} = 2\sqrt[4]{2} - \frac{2\sqrt[4]{2}}{2} = 2\sqrt[4]{2} - \sqrt[4]{2} = \sqrt[4]{2}$ (e)

13. 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) 62×10^{-5} (b) 6.2×10^{-5} (c) 1.3×10^{-4} (d) 0.62×10^{-3} (e) 6.2×10^{-4}

Ans: $= \frac{(93 \times 52)(10^6 \times 10^{-8})}{(26 \times 3)(10^{-11} \times 10^{15})} = \frac{(31 \times 2) \times 10^{-2}}{10^4} = 62 \times 10^{-6} = 6.2 \times 10^{-5}$ (b)

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

- (a) $9x^2 - 36x + 16$ (b) $9x^2 + 36x + 16$ (c) $27x^2 - 12x + 16$ (d) $9x^2 + 6x + 4$ (e) $3x^2 - 6x + 2$

Ans: $= (9x^3 + 8)^3 [36x^3 - (9x^3 + 8)] = (9x^3 + 8)^3 (36x^3 - 9x^3 - 8) = (9x^3 + 8)^3 (27x^3 - 8)$
 $= (9x^3 + 8)^3 (3x - 2)(9x^2 + 6x + 4)$. So $9x^2 + 6x + 4$ is one of the factors (d)

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

- (a) $\frac{3x+5}{(x-2)(2x+1)}$ (b) $\frac{2x+1}{x-2}$ (c) $\frac{5x-2}{x-3}$ (d) $\frac{3x+5}{x-2}$ (e) $\frac{5x+3}{x-2}$

Ans: $= \frac{6x^2}{3(x-2)} - \frac{(2x+1)^2}{x-2} \times \frac{x-3}{2x+1} = \frac{2x^2}{x-2} - \frac{(2x+1)(x-3)}{x-2}$
 $= \frac{2x^2 - (2x^2 - 5x - 3)}{x-2} = \frac{5x+3}{x-2}$ (e)

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