

Algebra

1. For the nonzero numbers a , b , and c , define

$$J(a, b, c) = \frac{a}{b} + \frac{b}{c} + \frac{c}{a}.$$

Find $J(2, 12, 9)$.

- (A) 4 (B) 5 (C) 6 (D) 7 (E) 8
2. What is the value of
- $$(3x - 2)(4x + 1) - (3x - 2)4x + 1$$
- when $x = 4$?
- (A) 0 (B) 1 (C) 10 (D) 11 (E) 12
3. Let d and e denote the solutions of $2x^2 + 3x - 5 = 0$. What is the value of $(d - 1)(e - 1)$?
- (A) $-\frac{5}{2}$ (B) 0 (C) 3 (D) 5 (E) 6
4. Suppose that a and b are nonzero real numbers, and that the equation $x^2 + ax + b = 0$ has solutions a and b . Then the pair (a, b) is
- (A) $(-2, 1)$ (B) $(-1, 2)$ (C) $(1, -2)$ (D) $(2, -1)$ (E) $(4, 4)$
5. Suppose A , B , and C are three numbers for which $1001C - 2002A = 4004$ and $1001B + 3003A = 5005$. The average of the three numbers A , B , and C is
- (A) 1 (B) 3 (C) 6 (D) 9 (E) Not uniquely determined
6. Simplify
- $$\sqrt[3]{x \sqrt{x^3 \sqrt{x^3 \sqrt{x \sqrt{x}}}}}$$
- (A) \sqrt{x} (B) $\sqrt[3]{x^2}$ (C) $\sqrt[27]{x^2}$ (D) $\sqrt[54]{x}$ (E) $\sqrt[81]{x^{80}}$
7. Compute the sum of all the roots of $(2x + 3)(x - 4) + (2x + 3)(x - 6) = 0$.
- (A) $7/2$ (B) 4 (C) 5 (D) 7 (E) 13
8. The product of three consecutive positive integers is 8 times their sum. What is the sum of their squares?
- (A) 50 (B) 77 (C) 110 (D) 149 (E) 194