

ALGEBRA MEDLEY 2023 – Team Member 1 – Operations and Simplifications – 2023 PSU Math Relays

Calculators allowed

Shade the letter of the **simplest** correct answer in the appropriate space on the answer sheet.

1. Expand $(x - 2)^4$

- (A) $x^4 - 16$ (B) $x^4 - 8x^2 + 16$ (C) $x^4 - 8x^3 + 24x^2 - 32x + 16$ (D) $x^4 - 16x^2 + 16$
(E) none of these

2. Simplify $3x - \{4x^3 - [6x^2 - 5x(-3x^2 + 2x) - 7x]\} - 8x^3$

- (A) $3x^3 - 4x^2 - 4x$ (B) $-20x^3 - 4x^2 - 4x$ (C) $-20x^3 + 16x^2 + 4x$ (D) $-19x^3 + 4x^2 + 10x$
(E) none of these

3. Simplify $(g \circ f)(-4)$ for $f(x) = x^3 - 5x + 3$ and $g(x) = \frac{7}{x+6}$

- (A) $-\frac{7}{5}$ (B) $\frac{7}{93}$ (C) $-\frac{7}{81}$ (D) $-\frac{1}{5}$ (E) none of these

4. Factor completely: $k^3 + 2k^2 - 4k - 8$

- (A) $(k - 2)^3$ (B) $(k^2 + 2)(k - 4)$ (C) $(k + 2)^2(k - 2)$ (D) $(k + 2)(k^2 - 2k + 4)$ (E) none of these

5. Factor completely: $-6x^2 + 45 - 3x$

- (A) $(-6x + 15)(x + 3)$ (B) $(-3x + 9)(2x - 5)$ (C) $-3(2x - 5)(x + 3)$ (D) $-3(2x^2 - 15 + x)$
(E) none of these

6. If $x = \frac{1}{5}$, then $3x - \frac{1}{x} + 2 =$

- (A) 1 (B) $-\frac{12}{5}$ (C) $-\frac{6}{5}$ (D) 0 (E) none of these

7. Simplify $\frac{6x+12}{x^2-4} \div \frac{8x+16}{4x-8}$

- (A) 3 (B) $\frac{3}{x-2}$ (C) $\frac{3}{x+2}$ (D) $\frac{12(x+2)}{(x-2)^2}$ (E) none of these

8. Simplify $\frac{-6}{x+5} - \frac{x}{x-1} + \frac{x^2+5}{x^2+4x-5}$

- (A) $\frac{11}{x+5}$ (B) $\frac{-(x-11)}{(x-1)(x+5)}$ (C) $\frac{-x-1}{(x+5)(x-1)}$ (D) $\frac{2x^2-x+11}{(x-1)(x+5)}$ (E) none of these

9. Simplify $\frac{5+2i}{3-i}$

- (A) $\frac{13}{10} + \frac{11}{10}i$ (B) $\frac{3}{5} + \frac{11}{10}i$ (C) $\frac{17}{10} + \frac{1}{10}i$ (D) $\frac{5}{3} - 2i$ (E) none of these