

Simplifying Rational Expressions — Answers

Factored form, simplified form, and restrictions from the original denominator.

Answer Key

A cancelled denominator factor still creates an excluded value.

Part A — GCF & Common Factors

1.
$$\frac{6x^2}{9x}$$

Factor: $(3x)(2x) / [(3x)(3)]$

Simplified: $2x/3$

$x \neq 0$

2.
$$\frac{x^2 + 5x}{x}$$

Factor: $x(x + 5) / x$

Simplified: $x + 5$

$x \neq 0$

3.
$$\frac{2x^2 + 8x}{2x}$$

Factor: $2x(x + 4) / 2x$

Simplified: $x + 4$

$x \neq 0$

4.
$$\frac{3x^2 - 12x}{6x}$$

Factor: $3x(x - 4) / 6x$

Simplified: $(x - 4)/2$

$x \neq 0$

5.
$$\frac{x^2 - 9}{x + 3}$$

Factor: $(x - 3)(x + 3) / (x + 3)$

Simplified: $x - 3$

$x \neq -3$

6.
$$\frac{x^2 - 16}{x^2 - 8x + 16}$$

Factor: $(x - 4)(x + 4) / (x - 4)^2$

Simplified: $(x + 4)/(x - 4)$

$x \neq 4$

7.
$$\frac{3x^2 - 12}{x^2 + x - 6}$$

Factor: $3(x - 2)(x + 2) / [(x - 2)(x + 3)]$

Simplified: $3(x + 2)/(x + 3)$

$x \neq 2, -3$

8.
$$\frac{x^3 - 9x}{x^2 - 6x + 9}$$

Factor: $x(x - 3)(x + 3) / (x - 3)^2$

Simplified: $x(x + 3)/(x - 3)$

$x \neq 3$

9.
$$\frac{2x^2 - 18}{x^2 + 6x + 9}$$

Factor: $2(x - 3)(x + 3) / (x + 3)^2$

Simplified: $2(x - 3)/(x + 3)$

$x \neq -3$

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Part C — Trinomial & Non-Monic Factoring

$$10. \quad \frac{x^2 - 4}{x^2 + x - 6}$$

Factor: $(x - 2)(x + 2) / [(x - 2)(x + 3)]$

Simplified: $(x + 2)/(x + 3)$

$x \neq 2, -3$

$$11. \quad \frac{x^2 - 5x + 6}{x^2 - 9}$$

Factor: $(x - 2)(x - 3) / [(x - 3)(x + 3)]$

Simplified: $(x - 2)/(x + 3)$

$x \neq 3, -3$

$$12. \quad \frac{x^2 + 7x + 12}{x^2 + 5x + 4}$$

Factor: $(x + 3)(x + 4) / [(x + 1)(x + 4)]$

Simplified: $(x + 3)/(x + 1)$

$x \neq -4, -1$

$$13. \quad \frac{2x^2 + x - 3}{2x^2 - 5x + 3}$$

Factor: $(2x + 3)(x - 1) / [(2x - 3)(x - 1)]$

Simplified: $(2x + 3)/(2x - 3)$

$x \neq 1, 3/2$

$$14. \quad \frac{4x^2 - 25}{2x^2 + 7x + 5}$$

Factor: $(2x - 5)(2x + 5) / [(2x + 5)(x + 1)]$

Simplified: $(2x - 5)/(x + 1)$

$x \neq -5/2, -1$

Part D — Grouping & Sign Reversal

$$15. \quad \frac{x^3 - 4x}{x^2 - x - 6}$$

Factor: $x(x - 2)(x + 2) / [(x - 3)(x + 2)]$

Simplified: $x(x - 2)/(x - 3)$

$x \neq -2, 3$

$$16. \quad \frac{x^2 - 4}{2 - x}$$

Factor: $(x - 2)(x + 2) / [-(x - 2)]$

Simplified: $-(x + 2)$

$x \neq 2$

$$17. \quad \frac{x^3 + 2x^2 - 9x - 18}{x^2 + 5x + 6}$$

Factor: $(x + 2)(x - 3)(x + 3) / [(x + 2)(x + 3)]$

Simplified: $x - 3$

$x \neq -2, -3$

$$18. \quad \frac{x^3 - 4x^2 - x + 4}{x^2 - 1}$$

Factor: $(x - 4)(x - 1)(x + 1) / [(x - 1)(x + 1)]$

Simplified: $x - 4$

$x \neq -1, 1$