Simplifying Rational Expressions & Non-Permissible Values

A rational expression is a quotient of two polynomials. Any value that makes the original denominator zero is a non-permissible value (NPV).

Remember: Cancel common factors, not terms. Cancelled denominator factors still create NPVs.
IDENTIFY NPV → FACTOR → SIMPLIFY

Instructions:
Simplify each expression completely and state all NPVs. Show your factoring and cancellation.

MILD	MEDIUM	SPICY	EXTRA SPICY
1. $\frac{6x}{9x}$	5. $\frac{x^2-9}{x+3}$	9. $\frac{x^2-9}{x^2+x-6}$	13. $\frac{2x^3-8x}{x^2+x-6}$
2. $\frac{3(x+2)}{5(x+2)}$	6. $\frac{x^2+5x+6}{x+2}$	10. $\frac{2x^2+10x+12}{x^2+7x+12}$	14. $\frac{6x^2-3x-9}{4x^2-9}$
3. $\frac{2x+6}{x+3}$	7. $\frac{6x^2-12x}{3x(x+4)}$	11. $\frac{x^2+5x+6}{x^2+5x+4}$	15. $\frac{(x^2-9)(x+1)}{(x^2+6x+9)(x-2)}$
4. $\frac{(x-4)(x+1)}{(x-4)(x+3)}$	8. $\frac{x^2-x-12}{(x-4)(x+3)}$	12. $\frac{x^2-4x+4}{4-x^2}$	16. $\frac{(x^2-4)(x-3)}{(x^2+x-6)(3-x)}$

17. Construct a rational expression with an expanded quadratic numerator and denominator that simplifies to $\frac{x+1}{x-4}$ and has exactly two NPVs: x = −2 and x = 4. Explain why.

18. Simplify both expressions and determine all NPVs.

Expression A: $\frac{x^2-9}{x^2-x-6}$ **Expression B:** $\frac{x^2+5x+6}{x^2+4x+4}$

Do these expressions represent the same function, including its domain? Explain.