13.0 Students add, subtract, multiply, and divide rational expressions and functions. Students solve both computationally and conceptually challenging problems by using these techniques.

4 CST items

Note: the standard is written more broadly than what is suggested by the released items. "Rational Expressions" and "Functions" can mean almost anything, but all three released items assessing this standard feature exclusively multiplication or division of *polynomial fractions**. There is no released item to suggest students will be asked to add or subtract these kinds of fractions (a far more complicated procedure, due to the need for common denominators, which is covered in greater detail in Algebra II).

**Polynomial Fractions* (not technically defined) is a far narrower subset of rational expressions, including fractions with polynomials in both the numerator and denominator, some of which may be factorable.

Key Vocabulary

Polynomial	**Numerator**	**Denominator**	**Reciprocal**
Factor (*v.*)	**Reduce**	**Square of a Binomial**	**Difference of Squares**

Instructional Objectives

1	Multiply fractions with polynomials in the numerator and denominator.	1 Simplify: $\frac{x-4}{5x+2} \bullet \frac{2x+5}{x+4}$
		2 Simplify: $\frac{x^2-9}{x^2+7x+10} \bullet \frac{x^2+2x-15}{x^2-6x+9}$
		3 Simplify: $\left(\frac{x^3+5x^2+4x}{x^2+4x+3}\right)\left(\frac{5x-5}{2x^2+8x}\right)$
		4 Simplify: $\left(\frac{8x^2+8x}{4x+8}\right)\left(\frac{x+2}{x^2+x}\right)$
2	Divide fractions with polynomials in the numerator and denominator.	1 Simplify: $\frac{3x+12}{x^2-1} \div \frac{5x+20}{5x^2-5}$
		2 Simplify: $\frac{x^2+8x+16}{x+5} \div \frac{2x+8}{x^2-25}$
		3 Simplify: $\frac{x^3+2x^2-8x}{5x-10} \div \frac{3x^3+12x}{60}$
		4 Simplify: $\frac{2x^2+10x}{2x-18} \div \frac{x^2+4x-5}{x^2-10x+9}$