1.4 Rational Expressions

Objectives: Find the domain of expressions; simplify rational expressions; factor rational expressions.

The **domain** of an expression is the set of all possible values the variable can have.

Example 1 Find the domain for the following expressions.

(a) $\frac{x-4}{x^2-4x-77}$

(b) $\frac{\sqrt{x}}{2x-8}$

Simplifying Expressions

Example 2 Simplify: $\frac{x^2-x-6}{x^2+2x} \cdot \frac{x+1}{x^2-2x-3}$

Example 3 Simplify: $\frac{2x^3+16}{x^2-2x-15} \div \frac{x^2-2x+4}{x^2-25}$

Example 4 Simplify: $\frac{13}{5x-20} - \frac{3}{5x+5}$

Example 5 Simplify: $\dfrac{\frac{3}{x}-\frac{4}{x+1}}{\frac{2}{x+1}+\frac{1}{2x}}$

Example 6 Simplify the expression by factoring the numerator: $\dfrac{2(x+1)(3x+1)^3-(x+1)^2(3)(3x+1)^2(2)}{((3x+1)^3)^2}$. Expressions like this arise from the use of *the quotient rule* in Calculus II.

Example 7 Simplify: $\dfrac{\frac{1}{2}(x-5)^{-1/2}(3x)-3(x-5)^{1/2}}{(3x)^2}$