

Rational expression:

- a fraction with polynomials in the numerator and denominator

- $\frac{3x^5 - 26x^4 - 40x^3}{\pi x^6 - 100\pi x^4}$ is an example of a rational expression; the numerator is a trinomial and the denominator is a binomial

Steps for Simplifying Rational Expressions:

1. remove parentheses and combine like terms (if necessary)
2. factor all the polynomials
3. cancel common factors

Once again, it is imperative that you understand how to factor polynomials prior to simplify rational expressions. Keep in mind that rational expressions are simply fractions, and just like any other type of fraction, they should be simplified completely by canceling common factors.

Example 1: Simplify the rational expressions completely.

a. $\frac{3x^5 - 26x^4 - 40x^3}{\pi x^6 - 100\pi x^4}$

b. $\frac{3 + 13x - 10x^2}{25x^2 - 1}$

$$\frac{-1(10x^2 - 13x - 3)}{(5x)^2 - (1)^2}$$

$$\frac{-1(10x^2 + 2x - 15x - 3)}{(5x + 1)(5x - 1)}$$

$$\frac{-1(2x(5x + 1) - 3(5x + 1))}{(5x + 1)(5x - 1)}$$

$$\frac{-1(5x + 1)(2x - 3)}{(5x + 1)(5x - 1)}$$

$$\frac{-1(5x + 1)(2x - 3)}{(5x + 1)(5x - 1)}$$

$$\frac{3 - 2x}{5x - 1}$$

$$c. \frac{3a^4 + 2a^3 - 3a - 2}{27a^4 + 8a}$$

$$d. \frac{x^8 - 256}{x^4 + x^2 - 20}$$

Answers to Examples:

$$1a. \frac{3x+4}{\pi x(x+10)}; 1b. \frac{-1(2x-3)}{5x-1}; 1c. \frac{(a-1)(a^2+a+1)}{a(9a^2-6a+4)}; 1d. \frac{(x^2+4)(x^4+16)}{x^2+5};$$