Section 10.2
Multiplying Rational Expressions

Multiplication of rational expressions, like multiplication of fractions, is done by multiplying numerator with numerator and denominator with denominator, and reduction to lowest terms.

Example: Multiply $\frac{40}{x^4} \cdot \frac{5x^2}{8}$

combine using one fraction $\frac{40 \cdot 5x^2}{x^4 \cdot 8}$ and reduce $\frac{8 \cdot 5 \cdot 5 \cdot x \cdot x}{x \cdot x \cdot x \cdot x \cdot 8} = \frac{25}{x^2}$

Example: Multiply $\frac{-3z}{9(z-1)} \cdot \frac{2z-2}{z^2}$

Factor 2 from $2(z-2)$ reduce 3, 9, z, and $(z-1)$ $\frac{(-3z)(2)(z-1)}{9(z-1)z^2} = \frac{-2}{3z}$

Example: Multiply $\frac{a^2-b^2}{2a+1} \cdot \frac{2a^2-5a-3}{a+b}$

Factor and reduce:
Numerator left: Factor difference of two squares.
Numerator right: Factor trinomial (subtraction of two products).
Denominators cannot be factored.

reduce $\frac{(a+b)(a-b)(2a+1)(a-3)}{(2a+1)(a+b)}$ multiply $(a-b)(a-3) = a^2-3a-ab+3b$

Practice:
Multiply.

1. $\frac{32}{x^3} \cdot \frac{5x^2}{16}$
2. $\frac{-5}{4x} \cdot \frac{-x^6}{x+3}$
3. $\frac{-4a}{8(a-1)} \cdot \frac{2a-2}{a^2}$
4. $\frac{5a}{6} \cdot \frac{a+4}{a-1}$
5. $\frac{x-1}{x-2} \cdot \frac{x+1}{x+2}$
6. $\frac{2a+5}{5} \cdot \frac{6}{a-6}$
7. $\frac{b-5}{b^2+1} \cdot \frac{b+1}{b^2-1}$
8. $\frac{y+1}{3+y} \cdot \frac{y-1}{y-2}$
9. $\frac{4a-1}{5a+1} \cdot \frac{a}{4a+1}$
10. $\frac{-3}{-1} \cdot \frac{5-m}{4-m}$
11. $\frac{6(x-2)}{5x} \cdot \frac{4x^2}{7(x-3)}$
12. $\frac{(a+1)^2}{a+3} \cdot \frac{(a+3)^2}{a+1}$
13. $\frac{6x+12}{4} \cdot \frac{14x}{7x+14}$
14. $\frac{4}{a^2-1} \cdot \frac{a+1}{3}$
15. $\frac{3(1-a)}{7} \cdot \frac{12}{a-1}$
16. $\frac{4a}{3a-1}(6a-3)$
17. $\frac{5-4x}{5} \cdot \frac{3}{4x-5}$
18. $\frac{9y}{3y+4}(10y+5)$