

Rational Expressions:
Domain
Simplify
Multiply and Divide

Unit R5-R7
Section R5

Defn: Rational Expression

- The quotient of two polynomials P and Q, where $Q \neq 0$ is called a rational expression
- Ex: $\frac{x-10}{x+2}$, $\frac{(x+4)(y-3)}{(x-1)(y-3)}$

Defn: Domain

- The domain of a rational expression is the set of all real numbers for which the expression is defined.
 - All values where the denominator $\neq 0$

Ex: Find the Domain, then simplify

$\frac{x-10}{x+2}$	$\frac{(x+4)(x-3)}{(x-1)(x-3)}$	$\frac{x^2-9}{x^2-5x+6}$ $(x-2)(x-3)$
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If $x = -2$, then the expression is undefined. So, domain equals all values except -2

$\{x \mid x \neq -2\}$
line means "such that"

$\{x \mid x \neq 1, 3\}$
even though (x-3) cancels, you must look at the original, unreduced expression when determining domain

$\{x \mid x \neq 2, 3\}$

Ex: Multiply or Divide

$\frac{15p^3}{9p^2} + \frac{6p}{10p^2}$	$\frac{x^2+x}{25} \cdot \frac{5}{xy+y}$	$\frac{m^2+3m+2}{m^2+5m+4} + \frac{m^2+5m+6}{m^2+10m+24}$
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Handwritten solutions:

- $\frac{15p^3}{9p^2} + \frac{6p}{10p^2} = \frac{5p^2}{3} + \frac{10p^2}{6p} = \frac{5p^2}{3} + \frac{10}{3} = \frac{5p^2 + 10}{3}$
- $\frac{x(x+1)}{25} \cdot \frac{5}{y(x+y)} = \frac{x(x+1)}{5y(x+y)}$
- $\frac{(m+2)(m+1)}{(m+4)(m+1)} + \frac{(m+6)(m+4)}{(m+2)(m+3)} = \frac{m+2}{m+4} + \frac{(m+6)(m+4)}{(m+2)(m+3)}$

Ex: Multiply

$\frac{4b-ba+4d-da}{16-a^2}$	$\frac{b^2-d^2}{cb-cd+2ab-2ad}$ $c(b-d) + 2a(b-d)$
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Handwritten solution:

$\frac{b(4-a) + d(4-a)}{(4+a)(4-a)} \cdot \frac{(b+d)(b-d)}{(c+2a)(b-d)} = \frac{(b+d)(4-a)}{(4+a)(c+2a)}$