Tri Le
MATH 1314
College Algebra
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10/01/18

P.5 Rational Expressions

$$\frac{12}{16} = \frac{3 \cdot 4}{4 \cdot 4} = \frac{3}{4}$$

$$\frac{15x^2}{35x^5} = \frac{3 \cdot 5 \cdot x \cdot x}{7 \cdot 5 \cdot x \cdot x \cdot x \cdot x \cdot x} = \frac{3}{7x^3}$$

$$\frac{9x^2 + 9x}{2x+2} = \frac{9x(x+1)}{2(x+1)} = \frac{9x}{2}$$

$$\frac{x^2+8x-20}{x^2+11x+10} = \frac{(x+10)(x-2)}{(x+10)(x+1)} = \frac{(x-2)}{(x+1)}$$

$$\frac{x^2-16}{x-4} = \frac{(x+4)(x-4)}{4-x}$$

I can cancel a number and its opposite IF I introduce a factor of -1.

$$\frac{12-4x}{x-3} = \frac{4(3-x)}{x-3} = -4$$

$$\frac{4a^2-9b^2}{12b-8a} =$$

Limitations on the Domain of an Algebraic Expression

(**Domain** means, "acceptable values for x".)

1. No value is allowed in the domain that causes the denominator to be zero.

   Consider $\frac{3x}{2x-8}$

Strategy #1: Set the denominator equal to zero and solve. When you solve the equation, you have just discovered what x CANNOT be. Your domain is everything except that (those) value(s).

2. No value is allowed in the domain that results in a negative number under a radical with an even index (ex. A square root; a fourth root; etc.)

   Consider $\sqrt{3x-15}$

Strategy #2: Take the radicand (what's under the radical) and set it "greater than or equal to" zero. Solve the inequality. This IS your domain. Remember that there is only a potential problem with the domain when the index is even.

Questions to ask when you're looking for THE DOMAIN

1) Will any value of x result in a zero denominator? If "yes", follow Strategy #1 above.
2) Will any value of x result in a negative number under a radical with an even index? If "yes", follow Strategy #2 above.

If you answer "no" to both questions, your Domain is All Real Numbers.

Domain: Available values for x

Anything except 4: $\{x \mid x \in \mathbb{R}, x \neq 4\}$

$\sqrt{-4}$ = error in calculator

$\sqrt{3x-15} \Rightarrow$ Take $3x-15 \geq 0$

All real #'s ≥ 0...

$\frac{3x+12}{17}$; domain = ?

$\sqrt[3]{3x+9}$; domain = all reals