Fractions

Addition and Subtraction of Fractions

Must have a common denominator

$$\frac{3}{2} + \frac{7}{5} = \frac{3(5) + 7(2)}{2(5)}$$

So when the denominators do not have a common factor they are multiplied together to get the common denominator

The tops (numerators) are cross multiplied with the denominators.

Why? $\frac{3}{2} = \frac{3(5)}{2(5)}$ → $2\overline{)10}$ (5)

$+ \frac{7}{5} = \frac{7(2)}{2(5)}$ → $5\overline{)10}$ (2)

When one denominator (2) is a factor of the other denominator (4) then 4 is the least common denominator

$$\frac{3}{2} + \frac{5}{4} = \frac{2(3)+5}{4}$$ $2\overline{)4}$ (2)

4 is also called the least common multiple

$\frac{1}{6} + \frac{7}{15}$ We need to find the least common multiple

multiples of 6: 6, 12, 18, 24, 30, 36, ...
multiples of 15: 15, 30, 45, 60, ...

So the LCM is 30 and that is our common denominator

$\frac{1}{6} = \frac{1(5)}{30}$ $6\overline{)30}$ (5)

$+ \frac{7}{15} = \frac{7(2)}{30}$ $15\overline{)30}$ (2)

Rational Expressions

Remember $\frac{0}{5} = 0$ but $\frac{5}{0}$ is undefined.

Negatives

$$\frac{-5}{3} = \frac{5}{-3} = -\frac{5}{3}$$

Domain of Rational Function, consist of all real numbers except for the values that make the denominator equal to zero.

1) Set the denominator = to zero and solve for the variable

2.) The domain is all real numbers, except for the solution of #1

3.) Write the domain in either set-builder notation or interval notation

$f(x) = \frac{2x+3}{4x-8}$ 1) $4x-8=0$, $4x=8$, $x=8/4$, $x=2$ 2.) Domain is all $\mathbb{R}$ except $x=2$ 3.) $\{x \mid x \neq 2\}$ or $(-\infty,2) \cup (2,\infty)$

$$\frac{26}{39} = \frac{2 \cdot 13}{3 \cdot 13} = \frac{2}{3} \cdot \frac{13}{13} = \frac{2}{3} \cdot 1 = \frac{2}{3}$$

Factor out 13 from 26 and 39
$26/13 = 2$ and $39/13 = 3$
So the fraction reduces by 13 to 2/3

Apply this to a function

$$f(x) = \frac{x^2-9}{x^2-4x+3}$$

$$= \frac{(x-3)(x+3)}{(x-3)(x-1)}$$ difference of squares

$$= \frac{x+3}{x-1}$$

$$f(x) = \frac{4y-2}{2-4y} = \frac{4y-2}{-4y+2} = \frac{-(4y-2)}{-1(4y-2)} = \frac{1}{-1} = -1$$

$$f(x) = \frac{5x^2-10x}{5x^2-20} = \frac{5x\left(\frac{5x^2}{5x} - \frac{10x}{5x}\right)}{5\left(\frac{5x^2}{5} - \frac{20}{5}\right)} = \frac{5x(x-2)}{5(x^2-4)}$$

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