Handout Typos

§6.3 #43 $3x^{-1} = \frac{3}{x}$

Typo → $(2y)^{-1} = \frac{1}{2y}$

§6.4 Do #9, not #19.

§6.2 #1 you can prob'ly just do it once.

Test Pg 1. Whole class struggled with actual numbers.

$$\frac{3}{15} = \frac{3}{5\cdot 3} = \frac{1\cdot 3}{5\cdot 3} = \frac{1}{5}\cdot\frac{3}{3} = \frac{1}{5}$$

$$\frac{\cancel{3}^{1}}{\cancel{15}_{5}} = \frac{1}{5}$$

$3^{2-(-3)} = 3^5$

$$\left(\frac{3^2}{6^{-3}}\right)^4 = \left(\frac{3^2}{(3\cdot 2)^{-3}}\right)^4 = \left(\frac{3^2}{3^{-3}\cdot 2^{-3}}\right)^4 = \left(\frac{3^5}{2^{-3}}\right)^4 = \frac{3^{20}}{2^{-12}}$$

$$= \boxed{3^{20}\cdot 2^{12}}$$

$$\left(\frac{3^2}{6^{-3}}\right)^4 = \frac{3^8}{6^{-12}} = \frac{3^8}{(3\cdot 2)^{-12}} = \frac{3^8}{3^{-12}\cdot 2^{-12}} = \frac{3^{8-(-12)}}{2^{-12}}$$

$$= 3^{20}\cdot 2^{12}$$

§6.1

Polynomial Recall

$P(x) = 3x^2 + 5x - 1$

$Q(x) = \frac{1}{2}x^3 - 2x^2 + 7$

New! Rational Functions

$R(x) = \frac{P(x)}{Q(x)}$ A quotient of polynomials.

If x is real, $P(x)$ & $Q(x)$ are real.

The domain of a polynomial is all real numbers: $\{x \mid x \text{ is real}\}$

The set of all x where x is real.

What's $\frac{0}{3} = 0$

$\frac{3}{0}$ Does not exist. Is not real

$\frac{P(x)}{Q(x)} = R(x)$ doesn't exist when $Q(x) = 0$.

Domain of $R(x) = \{x \mid x \text{ is real AND } Q(x) \neq 0\}$

E $R(x) = \frac{x^2 - 3x + 2}{x + 5}$

$\mathcal{D}$ = Domain $= \{x \mid x \text{ is real AND } x + 5 \neq 0\}$

$= \{x \mid x \text{ is real and } x \neq -5\}$

$x + 5 \neq 0$

$x \neq -5$

$$R(x) = \frac{5x+4}{x^2-3x-10}$$

$\mathcal{D} = \{x \mid x \text{ is real and } x^2-3x-10 \neq 0\}$

$\{x \mid x \text{ is real and } x \neq -2 \text{ and } x \neq 5\}$

Scratch: Solve $x^2-3x-10=0$ & ditch the soln.

$x^2-3x-10=0$ $\quad (1)(-10) = -10$, $(-5)(2) = -10$, $-5x+2x = -3x$

$x^2-5x+2x-10=0$

$x(x-5)+2(x-5)=0$

$(x-5)(x+2)=0$ $\quad$ ½ the class.

$x-5=0$ OR $x+2=0$

$+5 \quad +5$ $\quad -2 \quad -2$

$x=+5$ $\quad x=-2$

$x=5$ OR $x=-2$ Ditch 'em.

$\{x \mid x \text{ is real and } x \neq -2 \text{ and } x \neq 5\}$

Fundamental Principle of Rational Functions.

$$\frac{AB}{CB} = \frac{A}{C} \cdot \frac{B}{B} = \frac{A}{C}$$

$$\frac{6}{15} = \frac{2 \cdot 3}{3 \cdot 5} = \frac{2 \cdot 3}{5 \cdot 3} = \frac{2}{5} \cdot \frac{3}{3} = \frac{2}{5}$$

$$\frac{\cancel{6}^{2}}{\cancel{15}_{5}} = \frac{2}{5}$$

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

$$\frac{(x+2)\cancel{(x-3)}^{1}}{\cancel{(x-3)}_{1}(x-5)} = \frac{x+2}{x-5}$$

Simplify:

$$\frac{x^2-2x-15}{x^2+4x+3} = \frac{(x-5)(x+3)}{(x+1)(x+3)} = \frac{x-5}{x+1}\cdot\frac{x+3}{x+3} = \frac{x-5}{x+1}$$

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

This is cancelling greatest common factors.

$$\frac{36}{24} = \frac{6\cdot 6}{6\cdot 4} = \frac{6}{4} = \frac{3\cdot 2}{2\cdot 2} = \frac{3}{2}$$

$2\,|\,36$, $2\,|\,18$, $3\,|\,9$, 3

$2\,|\,24$, $2\,|\,12$, $2\,|\,6$, 3

Factoring into product of primes.

$$\frac{\cancel{2}\cdot\cancel{2}\cdot\cancel{3}\cdot 3}{\cancel{2}\cdot\cancel{2}\cdot 2\cdot\cancel{3}} = \frac{3}{2}$$

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$$\frac{x^3+64}{x+4} = \frac{(x+4)(x^2-4x+16)}{(x+4)} = x^2-4x+16$$

$\neq 0$ if x is real.

Doesn't factor.

Multiplying & Dividing

$$\left(\frac{2}{3}\right)\left(\frac{5}{11}\right) = \frac{2\cdot 5}{3\cdot 11} = \frac{10}{33}$$

$$\left(\frac{a}{b}\right)\left(\frac{c}{d}\right) = \frac{ac}{bd}$$

$$\frac{a}{b}\cdot\frac{c}{d} = \frac{ac}{bd}$$

$$\left(\frac{x+1}{x-5}\right)\left(\frac{x-3}{x+5}\right) = \frac{(x+1)(x-3)}{(x-5)(x+5)}$$

Product of quotients is quotient of products

Multiply & simplify

$$\left(\frac{x^2-4}{x+3}\right)\left(\frac{x^2+5x+6}{x^2+3x+2}\right) = \frac{(x-2)(x+2)(x+2)(x+3)}{(x+3)(x+2)(x+1)}$$

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

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

Invert & Multiply, saith the Lord:

$$\frac{x+2}{x-3} \div \frac{x-1}{x-3} = \frac{x+2}{\cancel{x-3}} \cdot \frac{\cancel{x-3}}{x-1} = \frac{x+2}{x-1}$$

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

$$\frac{\frac{x+2}{x-3}}{\frac{x-1}{x-3}} =$$ Same Deal.

$$\frac{x+2}{x-3} \div \frac{x-1}{x+3} = \frac{x+2}{x-3} \cdot \frac{x+3}{x-1} = \frac{(x+2)(x+3)}{(x-3)(x-1)}$$

Can only cancel factors.

$$\frac{\cancel{x+3}}{\cancel{x-3}}$$ Noooo!