

Polynomial:

An expression that can have constants, variables and exponents, that can be combined using addition, subtraction, multiplication and division, but:

- not divided by a variable.
- exponents can only be positive whole numbers (0,1,2,3,... etc.)
- it can't have an infinite number of terms.
- each term is separated by a plus or minus sign

$6x^{-2}$	This is NOT a polynomial term...	...because the variable has a negative exponent.
$\frac{1}{x^2}$	This is NOT a polynomial term...	...because the variable is in the denominator
$\sqrt{9x^2}$	This is NOT a polynomial term...	...because the variable is inside a radical
$4x^2$	This IS a polynomial term...	...because it obeys all the rules.

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Polynomials are named by its leading degree and number of terms

(exponent)

5 Constant
x variable

$5x$ Linear monomial

$5x^2$ Quadratic monomial

$5x^3$ Cubic monomial

$5x-1$ Linear Binomial

$5x^2-x$ Quadratic Binomial

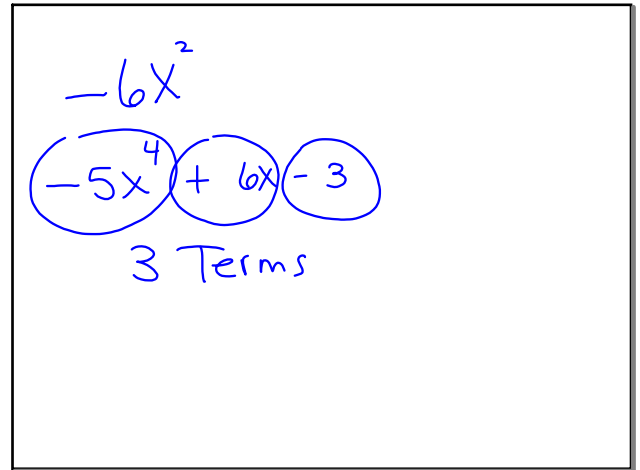
$5x^3-3$ Cubic Binomial

$5x^2+x-1$ Quadratic Trinomial

$5x^3-x^2+5$ Cubic Trinomial

$6x^3 - 16x^2 + 5x - 3$
 ↑
 Leading coefficient
 ↑
 Leading degree

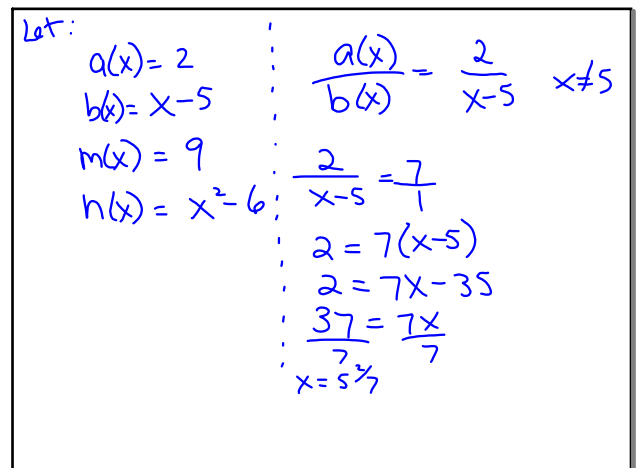
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$\frac{1}{0}$
 →
 Undefined
 No NO NO

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$$\frac{2}{x-5} = \frac{7}{1}$$

$$2 = 7(x-5)$$

$$2 = 7x - 35$$

$$\begin{array}{r} +35 \\ 2 = 7x - 35 \\ +35 \\ \hline 37 = 7x \\ \frac{37}{7} = \frac{7x}{7} \\ 5\frac{2}{7} = x \quad x \neq 5 \end{array}$$

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$$m(x) = \frac{9}{x^2-16} = 9$$

$$n(x) = \frac{9}{x^2-16}$$

$$x^2-16=0$$

$$\begin{array}{r} +16 +16 \\ \hline \sqrt{x^2-16} \end{array}$$

$$x \neq 4$$

$$x \neq -4$$

$$9(x^2-16) = 9$$

$$x = 4$$

$$-4$$

$$\left. \begin{array}{l} \text{Don't} \\ \text{need} \\ \text{to} \\ \text{know} \end{array} \right\} \begin{array}{l} 9x^2 - 144 = 9 \\ 9x^2 - 144 - 9 = 0 \\ 9x^2 - 153 = 0 \\ 9(x^2 - 17) = 0 \end{array}$$

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$$f(x) = \frac{2}{x} \quad 1) f(x) = h(x)$$

$$g(x) = x + 5$$

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

$$\frac{2}{x} = \frac{4}{x-3}$$

$$x-3=0$$

$$\begin{array}{r} +3 +3 \\ \hline x = 3 \end{array}$$

$$x \neq 0$$

$$x \neq 3$$

$$2(x-3) = 4x$$

$$\begin{array}{r} 2x - 6 = 4x \\ -2x \quad -2x \\ \hline -6 = 2x \\ \frac{-6}{2} = \frac{2x}{2} \\ -3 = x \end{array}$$

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$$\frac{g(x)}{g(x)} = 1$$

$$\frac{x+5}{x+5} = \frac{1}{1}$$

$$x+5 = x+5$$

$$\mathbb{R} \text{ except } -5$$

$$x \neq -5$$

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$$h(x) = \frac{1}{g(x)}$$

$$\frac{4}{x-3} = \frac{1}{x+5}$$

$$x \neq 3$$

$$x \neq -5$$

$$4(x+5) = 1(x-3)$$

$$4x + 20 = x - 3$$

$$3x = -23$$

$$\frac{3x}{3} = \frac{-23}{3}$$

$$x = -7\frac{2}{3}$$

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p70 #2

$$f(x) = \frac{4}{x}$$

$$g(x) = x-5$$

$$h(x) = x+8$$

$$p(x) = \frac{6}{x-3}$$

$$h(x) = 10$$

$$\frac{x+8}{x+8} = \frac{10}{1}$$

$$x \neq -8$$

$$x+8 = 10x+80$$

$$-72 = 9x$$

$$\frac{-72}{9} = \frac{9x}{9}$$

$$x = -8 \quad N/S$$

$$f(x) = p(x)$$

$$\frac{4}{x} = \frac{6}{x-3}$$

$$x \neq 0$$

$$x = 3$$

$$4x - 12 = 6x$$

$$-12 = 2x$$

$$x = -6$$

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$g(x)$ vs $\frac{1}{g(x)}$

$\frac{x-5}{x-5}$ vs $\frac{1}{x-5}$

\mathbb{R} All Real numbers $x \neq 5$

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$\frac{7x-4}{x(2x-3)(x^2-100)}$

$\frac{2x-3=0}{+3+3}$
 $\frac{2x}{2} = \frac{3}{2}$
 $x = \frac{3}{2}$

What are the constraints

$x \neq 0$
 $x \neq \frac{3}{2}$
 $x \neq 10$
 $x \neq -10$

$x^2 - 100 = 0$
 $\sqrt{x^2} = \sqrt{100}$
 $x = \pm 10$

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$\frac{8(t^2-16)}{2t(t^2-9)(t+2)}$

Constraints

$t \neq 6$
 $t \neq 3$
 $t \neq -3$
 $t \neq -2$

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Algebra Nation
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Let: $f(x) = \frac{2}{x}$
 $g(x) = x + 5$
 $h(x) = \frac{4}{x-3}$

$f(x) = h(x)$
 $\frac{2}{x} = \frac{4}{x-3}$ (Proportion \rightarrow CROSS PRODUCT)

$x \neq 0$ $x \neq 3$

$2(x-3) = 4(x)$
 $2x - 6 = 4x$
 $-2x \quad -2x$

$-6 = 2x$
 $\frac{-6}{2} = \frac{2x}{2}$
 $-3 = x$

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b) $\frac{x+5}{x+5} = \frac{1}{1}$
 $x \neq -5$

$x+5 = x+5$
 Infinitely many solutions

$x \neq -5$

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c) $h(x) = \frac{1}{g(x)}$

$\frac{4}{x-3} = \frac{1}{x+5}$

$x \neq 3$ $x \neq -5$

$1(x-3) = 4(x+5)$
 $x-3 = 4x+20$
 $-23 = 3x$
 $\frac{-23}{3} = \frac{3x}{3}$
 $-\frac{23}{3} = x$

$\frac{\#}{\emptyset}$ undefined

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$$h(t) = \frac{8(t^2-16)}{2t(t^2-9)(t+2)}$$

What makes this Quotient Undefined?

$t \neq 0$

$$\frac{t^2-9=0}{+9+9} \quad \frac{t+2=0}{-2-2}$$

$$\sqrt{t^2=9} \quad t = -2$$

$t = \pm 3$ $t \neq -2$

$t \neq -3$ $t \neq 3$

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Ex $\frac{t^2-16}{5t(t^2-25)(t+6)}$

$t \neq 0$ $t \neq \pm 5$ $t \neq -6$

Restrictions

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Closure

An operation (+, -, x, ÷) is closed if any 2 elements in the set produces an element of the same set.

natural numbers: {1, 2, 3, 4, 5, ...}

- Is this set closed under addition? Yes
- Multiplication? Yes
- Subtraction? No
Example (4-5=-1 not in set)
- Division? No

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{even #'s} {odd #'s}

Addition Yes ADDITION= NO {1,3}

Subtraction Yes SUBTRACTION NO (1,3)

Multiplication Yes Multiplication YES

Division Yes Division Yes

2 ÷ 3 = 7
15 ÷ 5 = 3

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Rational - Terminates
Repeats

$\frac{5}{2} = 2.5$ $\frac{10}{5} = 2$

$2.\overline{5}$
 $2.545454 = 2.\overline{54}$

Irrational $\sqrt{7} = 2.645751311...$
 $\frac{2}{7} = .285714286$ $\pi = 3.141593...$

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Set	+	-	x	÷
{0, 1, 2, 3, 4, ...}	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
{..., -4, -3, -2, -1}	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
{..., -3, -2, -1, 0, 1, 2, 3, ...}	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
{rational numbers}	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
{polynomials}	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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$y = 5x + 2$
 $y = 3$
 $x = 4$

Equations of a LINE

x	y
0	2
1	7
2	12
3	17
4	22

x	y
5	3
6	3
7	3
1	3

$x = 4$

x	y
4	22
4	17
4	12
4	7
4	2

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Quadratic a parabola

$x^2 - 4$
 x^2
 $-x^2 + x - 3$
 $-x^2 - 1$

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x^3
 $|x|$
 $-|x|$

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$y = 5x + 3$
 Equation of a Line
 $D = \mathbb{R}$ $R = \mathbb{R}$

x	y
0	3
1	8
-1	-2

$x = 4$

x	y
4	23
4	18
4	13
4	8
4	3
4	-2

$y = -2$
 $m = 0$

$y = -2$
 $(2, -2)(3, -2)(-5, -2)$

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$y = x^2$
 $y = x^2 - 4$
 $y = x^2 + 4x + 2$

$y = -x^2$
 $y = -x^2 - 4$
 $y = -x^2 + 4x + 2$

+ ↻

- ↻

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$y = |x|$
 $y = -|x|$

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$-x + 2y = 6$; D: $\{-4, -2, 0, 2\}$

$-(-4)$
 $-x + 2y = 6$ D: $\{-4, -2, 0, 2\}$

x	y
-4	1
-2	2
0	3
2	4

$4 + 2y = 6$
 $2y = 2$
 $y = 1$

$-2 + 2y = 6$
 $2y = 8$
 $y = 4$

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$-x + 2y = 6$

x	y
0	3
-6	0

Standard Form
 $ax + by = c$

$x=0$ solve for y
 $y=0$ solve for x

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4) $y = x^2 - 1$
 parabola

x	y
-3	8
-1	0
0	-1
1	0
3	8

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$y = .25x$

15 minutes
 $3.75 = .25(15)$

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