Conventions, Notations, and Abbreviations

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Conventions, notations, and abbreviations

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Abstract: This summary organizes the conventions, notations, and abbreviations adopted throughout the studies.

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1 Introduction

This summary organizes the conventions, notations, and abbreviations adopted throughout the studies.

2 Previous conventions:

Because our tables will show vertical sequences where the indexes will be on vertical and because on vertical, we have Y-axis in the XY-plane, so the sequences integers elements have to appear in X-axis as a function of the Y-axis.

Because of that, in all these studies we will represent any polynomial equation as being in the function of y, or just the function $Y[y]$, or $x = Y[y]$.

3 Notation for Polynomials In these studies

In these studies we are adopting the following criteria:

- We use the parentheses ( ) only in the formulas of the equations.
- We use the square brackets [ ] to express functions and finite sets of elements that produce a polynomial equation.
- We use the brackets { } for denotes the sequences of integers.
- The infinite sequences begin and/or end with the 3 dots...

Generically we will denote any polynomial element as being $Y[y]$.

When we want to draw the polynomial in the XY-plane, we will make x in the function of y. In the Cartesian plane (square lattice grid) we can consider $x = Y[y]$. In different grid other than Cartesian plane $x \neq Y[y]$.

When we want to distinguish the d^{th}-degree of the polynomial, we will note $Yd[y]$ or $x = Yd[y]$.

When we want to make a p^{th}-power operation on an d^{th}-degree polynomial, we will note: $(Yd[y])^p$.

- Constant (polynomial degree 0) will be written as

$$Y0[y] = c$$

  One element determines this polynomial. We will express this as

$$Y0[y] = [x_1]$$

- Linear (polynomial 1st-degree) will be written as

$$Y1[y] = by + c$$

  Two elements determine this polynomial. We will express this as

$$Y1[y] = [x_1, x_2]$$

- Quadratic (polynomial 2nd-degree) will be written as

$$Y2[y] = ay^2 + by + c$$

  Three elements determine this polynomial. We will express this as

$$Y2[y] = [x_1, x_2, x_3]$$

- Cubic (polynomial 3rd-degree) will be written as

$$Y3[y] = a_3y^3 + ay^2 + by + c$$

  Four elements determine this polynomial. We will express this as

$$Y3[y] = [x_1, x_2, x_3, x_4]$$

- Quartic (polynomial 4th-degree) will be written as

$$Y4[y] = a_4y^4 + a_3y^3 + ay^2 + by + c$$

  Five elements determine this polynomial. We will express this as

$$Y4[y] = [x_1, x_2, x_3, x_4, x_5]$$

- Quintic (polynomial 5th-degree) will be written as

$$Y5[y] = a_5y^5 + a_4y^4 + a_3y^3 + ay^2 + by + c$$

  Six elements determine this polynomial. We will express this as

$$Y5[y] = [x_1, x_2, x_3, x_4, x_5, x_6]$$

And so on for Sextic, Septic, Octic, Nonic, Decic, etc.

Generic equation of polynomial d^{th}-degree:

$$Yd[y] = a_dy^d + a_{d-1}y^{d-1} + \cdots + a_4y^4 + a_3y^3 + ay^2 + by + c$$

Generically, we will adopt these equalities notation:

$$Yd[-3] = e$$
$$Yd[-2] = f$$
$$Yd[-1] = g = x_1$$
$$Yd[0] = h = x_2$$
$$Yd[1] = i = x_3$$
$$Yd[2] = j$$
$$Yd[3] = k$$

4 Notation for index direction in any polynomial sequence

Any polynomial Integer sequence has 2 directions. This is the reason any polynomial has 2 recurrence equations. So, if the direction is

$$Yd[y] \equiv \{\dots, e, f, g, h, i, j, k, \dots\} =\backslash\{\dots, k, j, i, h, g, f, e, \dots\}\backslash$$

then, the reverse direction is

$$\backslash Yd[y]\backslash \equiv \{\dots, k, j, i, h, g, f, e, \dots\} =\backslash\{\dots, e, f, g, h, i, j, k, \dots\}\backslash$$

5 Inflection point vs. vertex nomenclature

Because of the definition of the inflection point is in differential calculus *"an inflection point, point of inflection, flex, or inflection (British English: inflexion[citation needed]) is a point on a continuous plane curve at which the curve changes from being concave (concave downward) to convex (concave upward), or vice versa,"*.

Because of the definition of the vertex: "*In geometry, a vertex (plural: vertices or vertexes) is a point where two or more curves, lines, or edges meet. As a consequence of this definition, the point where two lines meet to form an angle and the corners of polygons and polyhedra are vertices,*".

Because *"In the geometry of planar curves, a vertex is a point of where the first derivative of curvature is zero,"*

And like all studies between polynomials, no feature or phenomenon shows that there is a difference in behavior between quadratic and other polynomial orders, then there is no reason to differentiate the inflection point phenomena in quadratics from other polynomials. So, there is no reason to have different names.

In these studies, we will refer to this phenomenon in our tables, text, and figures as being only inflection points, even in quadratics which usually has the usual vertex name. The polynomials of a greater degree than quadratics will have two or more turning points besides the inflection point. But the common phenomenon among all polynomials is the inflection point.

The definition of a single Inflection Point nomenclature in common to all polynomials becomes important when we compare the behavior of the offset at all degrees.

In these studies, the coordinates of an inflection point in XY-plane are x_{ip} and y_{ip}. Also, we will denote an inflection point as being $ip(x_{ip}, y_{ip})$.

6 Map of colors for all figures and tables

Map of colors:
A000004 The Zero number, in red web color #FF0000.
A000012 The One number, in light-blue web color #3399CC.
A000040 The Prime numbers, in blue web color #336699.
A000290 The Square numbers (except Zero and One), in yellow web color #FFFF00.
A002378 The Oblong numbers (except Zero and Two), in red-dark web color #993333.
A005563 The Square minus One numbers (except 0 and −1), in orange-dark web color #FF6600.
All composites that are not a Square, an Oblong, or a (Square minus 1) numbers, in light-orange.

7 Color map for the two possible index directions (follows the Y-axis)

	15			-15
	14			-14
	13			-13
	12			-12
	11			-11
	10			-10
	9			-9
	8			-8
	7			-7
	6			-6
	5			-5
	4			-4
	3			-3
	2			-2
Y[1]	1		Y[-1]	-1
Y[0]	0		Y[0]	0
Y[-1]	-1		Y[1]	1
	-2			2
	-3			3
	-4			4
	-5			5
	-6			6
	-7			7
	-8			8
	-9			9
	-10			10
	-11			11
	-12			12
	-13			13
	-14			14
	-15			15

8 Index of letters and abbreviations adopted

a	Coefficient of the second-degree term of a polynomial.
b	Coefficient of the first-degree term of a polynomial.
c	Constant term of a polynomial. When capitalized, C represents the table column. When referenced in our tables, the c or C coefficient always appears along the X-axis.
CG	Composite Generator
d	The degree of a polynomial.
Δ	Discriminant of a parabola
f	When used alone, it represents the value of an offset of an Integer sequence.
g, h, i	Three constant and consecutive elements to form a parabola
ip	Inflection point.
LR	Latus rectum of a parabola
x_1, x_2, x_3	Three constant and consecutive elements to form a parabola
x_{ip}	The x-coordinate of the inflection point
x_{focus}	The x-coordinate of the focus of a parabola
y	Generally the index of an Integer sequence. It follows the Y-axis.
y_{ip}	The y-coordinate of the inflection point

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References

[1] *The On-Line Encyclopedia of Integer Sequences*, available online at http://oeis.org.

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