A pair of straight lines and the condition to meet each other or to stay parallel

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Abstract:

We have two straight lines in a graph. We need to determine if these straight lines will meet each other or remain parallel if we extend these lines. This paper helps us to determine this question. If we square a certain type of polynomial ($x^{p_n} - x^{p_{(n-1)}} - .... - x^{p_1} - 1$) and take the coefficient of x of this square on the x axis and the power of x on the y axis and if we make the graph, the spectra that will be created, consider the initial and final part of the spectra as two straight lines, then those two straight lines will meet each other or be parallel, it will depend on the n and p of this polynomial. That is, on the length and step of the polynomial.

Explanation:-

If we draw a graph taking the coefficient of the square of a polynomial type $x^{p_n} - x^{p_{(n-1)}} - ... - x^{p_1} - 1$ as x axis and exponents as y axis, where p_n, $p_{(n-1)}$, $p_{(n-2)}$,......., p_2, p_1,1 is any positive arithmetic series, then, the spectra have a characteristic that the two straight lines which are the tangents of the initial and trailing part of the square of the polynomial will meet at the point

$(3p_n/(p_1 - (n-1)/2) + 1, 3p_1p_n/(p_1 - (n-1)/2))$, where, $(p_1 - (n-1)/2 \neq 0$ and $p_n - p_{(n-1)} \neq p_{(n-1)} - p_{(n-2)}$

Or

$(3p_n / p_1 + 1, 3p_n)$, where, $p_n - p_{(n-1)} = p_{(n-1)} - p_{(n-2)}$

Or,

∞, where, $p_1 - (n-1)/2 = 0$ and $p_n - p_{(n-1)} \neq p_{(n-1)} - p_{(n-2)}$.

For intersection point $3p_n / (p_1 - (n-1)/2) + 1, 3p_1p_n / (p_1 - (n-1)/2)$, where, $(p_1 - (n-1)/2 \neq 0$ and $p_n - p_{(n-1)} \neq p_{(n-1)} - p_{(n-2)}$

The polynomial is $x^7 - x^3 - 1$, then, the square of the polynomial is $x^{14} - 2x^{10} - 2x^7 + x^6 + 2x^3 + 1$

Here, $7-3 \neq 3-0$ and 0, 3, 7 is an arithmetic series. If we draw the graph taking coefficient of x as x axis and power of x as y axis, then, the expansion of the straight lines which represent the initial part and trailing part correspondently x^{14}-2 x^{10} and +2 x^3+1, will be intersect at the point of (3*7/(3-(2-1)/2) +1, 3*3*7/(3-(2-1)/2)) =(9.4,25.2), which s also as Figure 1.

Certain examples are:-

Polynomial	Square	n	P_n	P_1	Intersection point
x^7-x^3-1	$x^{14}-2x^{10}-2x^7+x^6+2x^3+1$	2	7	3	(9.4, 25.2)
x^5-x^2-1	$x^{10}-2x^7-2x^5+x^4+2x^2+1$	2	5	2	(11,20)
$x^9-x^5-x^2-1$	$x^{18}-2x^{14}-2x^{11}+x^{10}-2x^9+2x^7+2x^5+x^4+2x^2+1$	3	9	2	(28,54)

For intersection point ($3p_n$ / p_1 +1, 3pn), where, $p_n - p_{(n-1)} = p_{(n-1)} - p_{(n-2)}$, as the Figure 2 and the examples are:-

Polynomial	Square	P_n	P_1	Intersection point
$x^4-x^3-x^2--x-1$	$x^8-2x^7-x^6+0x^5+x^4+4x^3+3x^2+2x+1$	4	1	(13,12)
x^4-x^2-1	$x^8-2x^6-x^4+2x^2+1$	4	2	(7,12)
x^6-x^3-1	$x^{12}-2x^9-x^6+2x^3+1$	6	3	(7,18)

And for ∞, where, p_1 -(n-1)/2 = 0 and $p_n - p_{(n-1)} \neq p_{(n-1)} - p_{(n-2)}$ as Figure 3 and the examples are:-

Polynomial	Square	n	P_n	P_1	Intersection point
x^6-x^3--x-1	$x^{12}-2x^9-2x^7-x^6+2x^4+2x^3+x^2+2x+1$	3	6	1	∞
$x^{20}-x^{14}-x^9-x^5-x^2-1$	$x^{40}-2x^{34}$-.......+....$+2x^2+1$	5	20	2	∞
$x^{42}-x^{33}-x^{25}-x^{18}-x^{12}-x^7-x^3-1$	$x^{84}-2x^{75}$-.......+.......$+2x^3+1$	7	42	3	∞

Here there is no possible to intersect each other for the two straight lines. That is two straight lines will be parallel if these satisfy the condition where these two straight lines are the heading and trailing parts of the square of the polynomial type $x^{p_n} - x^{p_{(n-1)}} - .... - x^{p_1}$, where, $p_1 - (n-1)/2 = 0$ and $p_n - p_{(n-1)} \neq p_{(n-1)} - p_{(n-2)}$

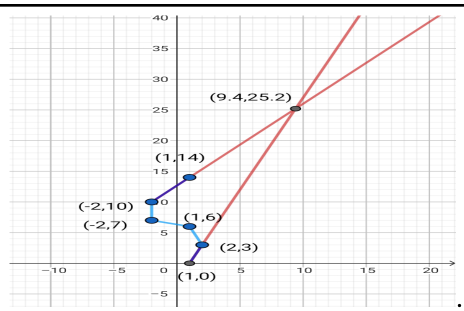

Figure 1

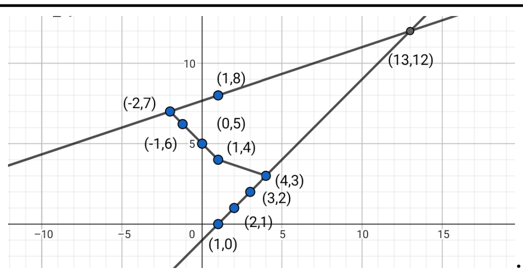

Figure 2

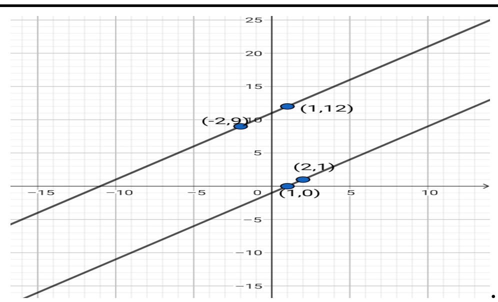

Figure 3

Reference

Binay Krishna Maity, p 90-91, Science and Culture, Jan-Feb 2012 issue