OVERVIEW OF PREPRINT 1603.02468

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ABSTRACT. In this paper a short and generalized review of preprint 1603.02468 is shown and future research in this direction is proposed. Describes a general idea and derivation steps of expressions.

Keywords. Perfect cube, Pascal's triangle, Power function

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1. General overview

In order to detail LinkedIn social network message to connection request this overview is written. Let describe the main results of work at arxiv.org/abs/1603.02468. The Series Representation of Power Function is built on the fact concerning first difference of cubes, with step $h = 1$, review the table

(1.1)

x	x^3	$\Delta[x^3]$	$\Delta^2[x^3]$	$\Delta^3[x^3]$
0	0	1	6	6
1	1	7	12	6
2	8	19	18	6
3	27	37	24	6
4	64	61	30	6
5	125	91	36	
6	216	127		
7	343			

Figure 1: Difference table of $x^3,\ x \in \mathbb{N}$

Define the difference as $\Delta[x^3] = (x+1)^3 - x^3$, then we can see that

$$\begin{aligned}
\Delta[0^3] &= 1 + 3! \cdot 0 \\
\Delta[1^3] &= 1 + 3! \cdot 0 + 3! \cdot 1 \\
\Delta[2^3] &= 1 + 3! \cdot 0 + 3! \cdot 1 + 3! \cdot 2 \\
\Delta[3^3] &= 1 + 3! \cdot 0 + 3! \cdot 1 + 3! \cdot 2 + 3! \cdot 3 \\
&\vdots \\
\Delta[x^3] &= 1 + 3! \cdot 0 + 3! \cdot 1 + 3! \cdot 2 + 3! \cdot 3 + \cdots + 3! \cdot x
\end{aligned} \tag{1.2}$$

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Obviously, the cube could written as

$$x^3 = (1 + 3! \cdot 0) + (1 + 3! \cdot 0 + 3! \cdot 1) + (1 + 3! \cdot 0 + 3! \cdot 1 + 3! \cdot 2)$$
$$\cdots + (1 + 3! \cdot 0 + 3! \cdot 1 + 3! \cdot 2 + \cdots + 3! \cdot (x-1))$$

Generalizing above expression, we have

$$x^3 = x + (x-0) \cdot 3! \cdot 0 + (x-1) \cdot 3! \cdot 1 + (x-2) \cdot 3! \cdot 2 + \cdots \tag{1.3}$$
$$\cdots + (x-(x-1)) \cdot 3! \cdot (x-1)$$

Particularizing expression (1.3) and applying compact sigma notation, one could have

$$x^3 = \sum_{m=1}^{x} 3! \cdot mx - 3! \cdot m^2 + 1 \tag{1.4}$$

Lets build a triangle using $3! \cdot kn - 3! \cdot k^2 + 1$ over k and n, where n - denotes the row, k - corresponding item of the row, note that $0 \leq k \leq n$

$$\begin{array}{ccccccccc} & & & & 1 & & & & \\ & & & 1 & & 1 & & & \\ & & 1 & & 7 & & 1 & & \\ & 1 & & 13 & & 13 & & 1 & \\ 1 & & 19 & & 25 & & 19 & & 1 \end{array} \tag{1.5}$$

Figure 1. Triangle generated by $3! \cdot kn - 3! \cdot k^2 + 1$, Sequence A287326 in OEIS.

Property 1.6. *Summation of each n-th row of Triangle (1.5) from $k = 0$ to $n - 1$ returns us n^3.*

Reader could notice that it has similar distribution to Pascal's triangle, hereby the follow questions is stated:

Question 1.7. *Has the Triangle (1.5) any connection with Pascal's Triangle or others like Stirling or Euler, and is it exist similar patterns in order to receive expansion of x^j $j > 3$?*

Answering on above question a very beautiful theorem could be built, thank you for attention,

Yours Sincerely,
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References

[1] https://arxiv.org/abs/1603.02468