

# LATEX TEMPLATE FOR GITHUB

PETRO KOLOSOV

ABSTRACT. Your abstract here.

## CONTENTS

1. Introduction	1
1.1. Rising factorials	4
1.2. Central factorials	4
1.3. Derivatives	5
Conclusions	5
Acknowledgements	5
References	5

## 1. INTRODUCTION

Your introduction here. Include some references [1, 2, 3]. Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley of type and scrambled it to make a type specimen book. It has survived not only five centuries, but also

---

*Date:* January 6, 2026.

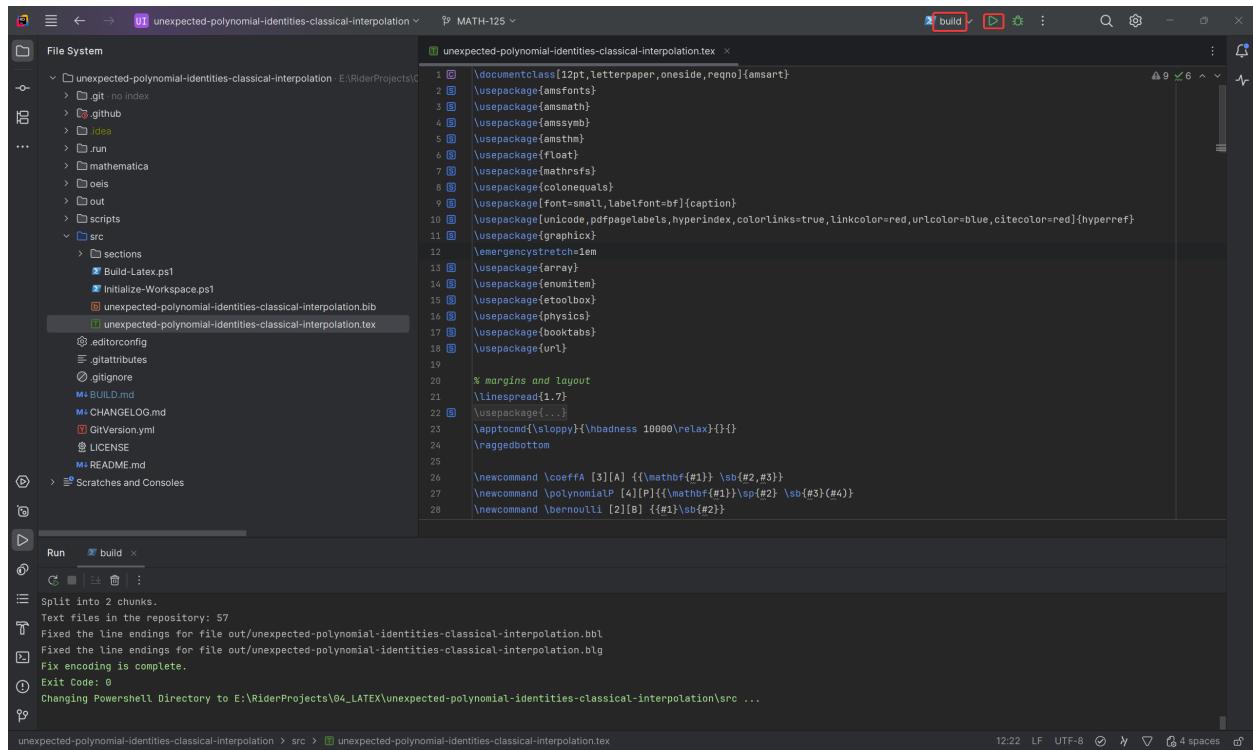
*2010 Mathematics Subject Classification.* 05A19, 05A10, 41A15, 11B68, 11B73, 11B83.

*Key words and phrases.* Sums of powers, Newton's interpolation formula, Finite differences, Binomial coefficients, Faulhaber's formula, Bernoulli numbers, Bernoulli polynomials Interpolation, Approximation, Discrete convolution, Combinatorics, Polynomial identities, Central factorial numbers, Stirling numbers, Eulerian numbers, Worpitzky identity, Pascal's triangle, OEIS.

DOI: <https://doi.org/10.5281/zenodo.18040979>

the leap into electronic typesetting, remaining essentially unchanged. It was popularised in the 1960s with the release of Letraset sheets containing Lorem Ipsum passages, and more recently with desktop publishing software like Aldus PageMaker including versions of Lorem Ipsum.

### Image example



The screenshot shows the Rider IDE interface with a LaTeX project open. The left sidebar displays the file system structure of the project, which includes a .git folder, .github, .idea, .run, mathematics, .oelis, .out, .scripts, and a src folder containing sections, Build-Latex.ps1, Initialize-Workspace.ps1, and the main LaTeX file unexpected-polynomial-identities-classical-interpolation.tex. The main editor window shows the content of unexpected-polynomial-identities-classical-interpolation.tex. The code is a LaTeX document class definition with various packages and document settings. The bottom status bar shows the current time as 12:22, file type as LF, encoding as UTF-8, and a code style indicator for 4 spaces.

```

1 \documentclass[12pt,letterpaper,oneside,reqno]{amsart}
2 \usepackage{amsfonts}
3 \usepackage{amsmath}
4 \usepackage{amsymb}
5 \usepackage{amstext}
6 \usepackage{float}
7 \usepackage{mathrsfs}
8 \usepackage{colonequals}
9 \usepackage[font=small,labelfont=bf]{caption}
10 \usepackage[unicode,pdfpageLabels,hyperindex,colorlinks=true,linkcolor=red,urlcolor=blue,citecolor=red]{hyperref}
11 \usepackage{graphicx}
12 \usepackage{array}
13 \usepackage{enumitem}
14 \usepackage{toolbox}
15 \usepackage{physics}
16 \usepackage{booktabs}
17 \usepackage{url}
18 % margins and layout
19 \linespread{1.7}
20 \usepackage{...}
21 \apptocmd{\lopp}{\badness 10000\relax}{}{ }
22 \raggedbottom
23 \newcommand{\coeffA}[3][A]{\mathbf{A}^{#1}_{#2#3}}
24 \newcommand{\polynomialP}[4][P]{\mathbf{P}^{#1}_{#2#3#4}}
25 \newcommand{\bernolliB}[2][B]{\mathbf{B}^{#1}_{#2}}

```

**Figure 1.** Image example (from caption).

$m/r$	0	1	2	3	4	5	6	7
0	1							
1	1	6						
2	1	0	30					
3	1	-14	0	140				
4	1	-120	0	0	630			
5	1	-1386	660	0	0	2772		
6	1	-21840	18018	0	0	0	12012	
7	1	-450054	491400	-60060	0	0	0	51480

**Table 1.** Coefficients  $\mathbf{A}_{m,r}$ . See OEIS sequences [4, 5].

$$\begin{array}{c} \left[ \begin{smallmatrix} a \\ b \end{smallmatrix} \right]_m \\ \left[ \begin{smallmatrix} a \\ b \end{smallmatrix} \right]_m \end{array}$$

And for any natural  $m$  we have polynomial identity

$$x^m = \sum_{k=1}^m T(m, k) x^{[k]} \quad (1)$$

where  $x^{[k]}$  denotes central factorial defined by

$$x^{[n]} = x \left( x + \frac{n}{2} - 1 \right)_{n-1}$$

where  $(n)_k = n(n-1)(n-2)\cdots(n-k+1)$  denotes falling factorial in Knuth's notation. In particular,

$$x^{[n]} = x \left( x + \frac{n}{2} - 1 \right) \left( x + \frac{n}{2} - 1 \right) \cdots \left( x + \frac{n}{2} - n - 1 \right) = x \prod_{k=1}^{n-1} \left( x + \frac{n}{2} - k \right) \quad (2)$$

This is an equation reference (1).

Continuing similarly, we are able to derive the formula for multifold sums of powers, which is

**Theorem 1.1** (Multifold sums of powers via Newton's series). *For non-negative integers  $r, n, m$  and an arbitrary integer  $t$*

$$\sum^r n^m = \sum_{j=0}^m \Delta^j t^m \left[ \left( \sum_{s=1}^r (-1)^{j+s-1} \binom{j+t-1}{j+s} \Sigma^{r-s} n^0 \right) + \binom{n-t+r}{j+r} \right]$$

*Proof.* By Newton's series for power and repeated applications of the segmented hockey stick identity.  $\square$

**Proposition 1.2** (Falling factorial).

$$(x)_n = x(x-1)(x-2)(x-3)\cdots(x-n+1) = \prod_{k=0}^{n-1} (x-k)$$

**Proposition 1.3.**

$$\frac{(x)_n}{n!} = \binom{x}{n}$$

1.1. Rising factorials.

**Proposition 1.4** (Rising factorial).

$$x^{(n)} = x(x+1)(x+2)(x+3)\cdots(x+n-1) = \prod_{k=0}^{n-1} (x+k)$$

**Proposition 1.5.**

$$\frac{x^{(n)}}{n!} = \binom{x+n-1}{n}$$

1.2. Central factorials.

**Lemma 1.6** (Central factorial).

$$n^{[k]} = n \left( n + \frac{k}{2} - 1 \right) \left( n + \frac{k}{2} - 2 \right) \cdots \left( n - \frac{k}{2} + 1 \right) = n \prod_{j=1}^{k-1} \left( n + \frac{k}{2} - j \right)$$

**Proposition 1.7.**

$$n^{[k]} = n \left( n + \frac{k}{2} - 1 \right)_{k-1}$$

### 1.3. Derivatives.

$$\frac{dx}{dy} = \frac{f(x+h) - f(x)}{h}$$

$$\frac{d^3x}{dy^3} = \frac{f(x+h) - f(x)}{h}$$

## CONCLUSIONS

Conclusions of your manuscript.

Here is an itemize list with adjusted margins

- Conclusion 1 ....
- Conclusion 2 ....
- Conclusion 3 ....

## ACKNOWLEDGEMENTS

The author is grateful to [Full Name] for his valuable contribution [contribution] about the fact that [interesting claim].

## REFERENCES

- [1] Petro Kolosov. Finding the derivative of polynomials via double limit. *GitHub*, 2024.
- [2] Alekseyev, Max. MathOverflow answer 297916/113033. <https://mathoverflow.net/a/297916/113033>, 2018.
- [3] Petro Kolosov. The coefficients U(m, l, k), m = 3 defined by the polynomial identity. <https://oeis.org/A316387>, 2018.
- [4] Petro Kolosov. Entry A302971 in The On-Line Encyclopedia of Integer Sequences. <https://oeis.org/A302971>, 2018.
- [5] Petro Kolosov. Entry A304042 in The On-Line Encyclopedia of Integer Sequences. <https://oeis.org/A304042>, 2018.

## Metadata

- **Version:** Local-0.1.0
- **MSC2010:** 05A19, 05A10, 41A15, 11B68, 11B73, 11B83
- **Keywords:** Sums of powers, Newton's interpolation formula, Finite differences, Binomial coefficients, Faulhaber's formula, Bernoulli numbers, Bernoulli polynomials Interpolation, Approximation, Discrete convolution, Combinatorics, Polynomial identities, Central factorial numbers, Stirling numbers, Eulerian numbers, Worpitzky identity, Pascal's triangle, OEIS
- **License:** This work is licensed under a [CC BY 4.0 License](#).
- **DOI:** <https://doi.org/10.5281/zenodo.18040979>
- **Web Version:** <https://kolosovpetro.github.io/math/test>
- **Sources:** [github.com/kolosovpetro/github-latex-template](https://github.com/kolosovpetro/github-latex-template)
- **ORCID:** 0000-0002-6544-8880
- **Email:** [kolosovp94@gmail.com](mailto:kolosovp94@gmail.com)

DEVOPS ENGINEER

*Email address:* [kolosovp94@gmail.com](mailto:kolosovp94@gmail.com)

*URL:* <https://kolosovpetro.github.io>