# LATEX TEMPLATE FOR GITHUB

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Abstract. Your abstract here.

## Contents



## 1. Introduction

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 the leap into electronic

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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

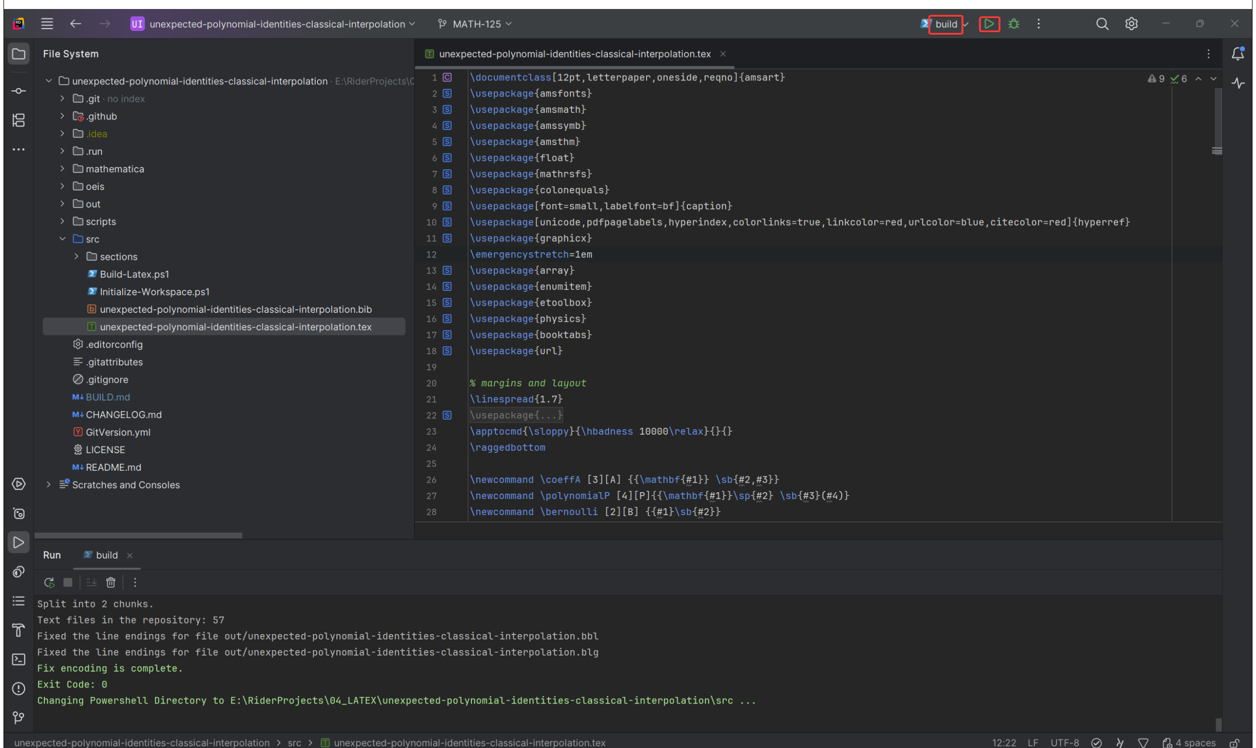


**Figure 1.** Image example (from caption).

| $m/r$ | 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].

$$\left\llbracket \begin{matrix} a \\ b \end{matrix} \right\rrbracket_m$$
$$\left\llbracket \begin{matrix} a \\ b \end{matrix} \right\rrbracket_m$$

And for any natural $m$ we have polynomial identity

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

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,

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

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 $t$*

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

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

**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.**

$$\frac{\mathrm{d}x}{\mathrm{d}y} = \frac{f(x+h)-f(x)}{h}$$

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

## 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

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