

**Spring 2024, Math 579: Preliminary Problem Set 4**  
**Due: Thursday, February 15th, 2024**  
**The Binomial Theorem**

**Preliminary problems.** These problems should be completed before discussion on Thursday.

(P1) Fill in blank:

$$\sum_{k=1}^n k^3 = \underline{\hspace{2cm}} + \sum_{k=2}^{n-1} (k+1)^3.$$

Hint: reindex, then pull out terms.

(P2) Plug in carefully chosen values for  $x$  and  $z$  in the binomial theorem to obtain the identity

$$\sum_{k=0}^n (-1)^k 2^{n-k} \binom{n}{k} = 1.$$