Tutorial Worksheet 2
MAT344 - Spring 2019

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1 Prove the following identity using the *Binomial Theorem*:

$$\sum_{0 \leqslant k \text{ even}}^{n} \binom{n}{k} 2^k = \frac{1}{2}(3^n + (-1)^n)$$

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2 Find (i) the **power series expansion** and (ii) **the coefficient on** x^3 for the following:

$$\sqrt[4]{1+x}$$

You can write your answer with "!!" or variable-length products like $1 \cdot 7 \cdot 13 \cdot ...(1+6k)$*, etc.*

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3 Prove the following for any positive integers n, m and $0 \leqslant r \leqslant n$, using a **combinatorial argument**:

$$\sum_{k=0}^{m} \binom{m}{k}\binom{n}{r+k} = \binom{m+n}{m+r}$$