Project 4 in FYS3150

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November 18, 2018

1 ABSTRACT

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2 INTRODUCTION

3 METHOD

$$Z = \sum_{i=1}^{M} e^{-\beta E_i}$$

$$\langle E \rangle = \frac{1}{Z} \sum_{i=1}^{M} E_i e^{-\beta E_i}$$

$$|M| = \frac{1}{Z} \sum_{i=1}^{m} M_i e^{-\beta E_i}$$

$$\begin{aligned} C_V &= \frac{1}{k_B T^2} \left(\langle E^2 \rangle - \langle E \rangle^2 \right) = \frac{1}{k_B T^2} \left(\frac{1}{Z} \sum_{i=1}^{m} E_i^2 e^{-\beta E_i} - \langle E \rangle^2 \right) \\ &= \frac{1}{k_B T^2} \left(\frac{(-8J)^2 \cdot e^{8\beta J} + 0 \cdot 4e^{0\beta J} + 0 \cdot 4e^{0\beta J} + (8J)^2 \cdot 2e^{-8\beta J} + 0 \cdot 4e^{0\beta J} + (-8J)^2 \cdot e^{8\beta J}}{Z} - \left(\frac{8Je^{-8\beta J} - 8Je^{8\beta J}}{e^{8\beta J} + e^{-8\beta J} + 6} \right)^2 \right) \\ &= \frac{1}{k_B T^2} \left(\frac{64J^2 \cdot 2e^{-8\beta J} - 64J^2 \cdot e^{8\beta J}}{e^{8\beta J} + e^{-8\beta J} + 6} - \frac{64J^2 e^{-16\beta J} - 128J^2 + 64J^2 e^{16\beta J}}{(Z/2)^2} \right) \end{aligned}$$

$$\chi = \frac{1}{k_B T} \left(\langle M^2 \rangle - \langle M \rangle^2 \right) = \frac{1}{k_B T} \left(\frac{1}{Z} \sum_{i=1}^{m} M_i^2 e^{-\beta E_i} - \langle M \rangle^2 \right)$$

With E_i and M_i found in tabel 13.4 in the lecture notes.

4 RESULTS

5 APPENDICES

6 REFERENCES

References

[1] Computational Physics, Lecture Notes Fall 2015, Morten Hjort-Jensen p.424