QMI : ZX-Calculus

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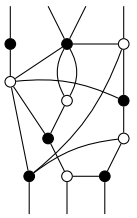
TD3: Phase-free normal form & CSS stabilisers

1 Normal Form

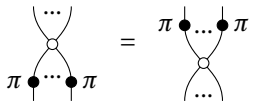
Question 1. Put the following diagram in Z-X normal form, then put it in X-Z normal form:



Question 2. Bend all input wires into outputs. Put the resulting diagram in Z-X and X-Z normal form.

2 Interaction of spiders and Paulis

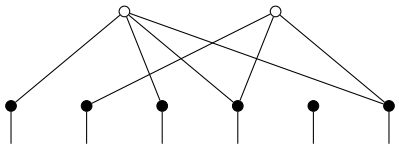
Question 1. Show the following equation (using the equational theory of ZX):



I.e. up to diagram deformation, we can complement the X gates around a Z-spider.

3 Stabilisers

Consider the following ZX state:



Question 1. Provide a generating set of its X stabilisers. Express the state in the canonical basis.

Question 2. Turn the diagram in $X-Z$ normal form. What are its Z stabilisers? Check with the X stabilisers that you have gathered **all** stabilisers (or a generating set for them). Express the state in the diagonal basis.

4 Circuit

Question 1. What are the stabilisers of the following circuit: