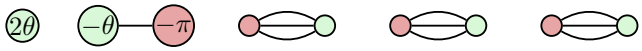
Introduction to Quantum Programming and Semantics 2025
Tutorial week 6

Exercise 1

(a) 

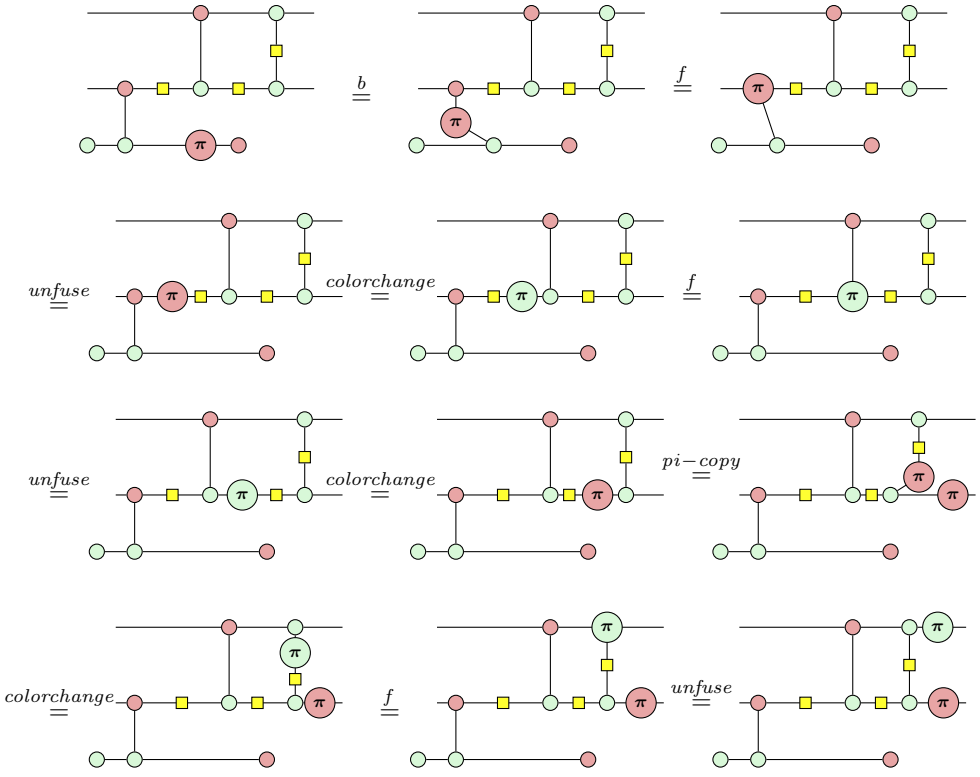
(b) 

(c) 

(d) 

(e) First fix a k such that for $z' = 1/\sqrt{2}^k z$ we have $|z'| \leq 1$. Then we can find phases α, β such that $z' = e^{i\alpha} \cos\beta$. Since we know how to write these three components as diagrams, we are then done.

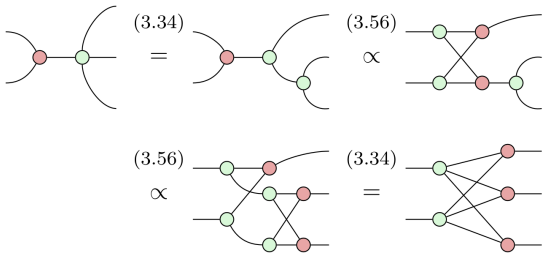
Exercise 2



Exercise 3

For $m = n = 2$ this is exactly the strong complementarity rule. For $m = 1$ or $n = 1$ this follows trivially by adding and removing identities. For $m = 0$ or $n = 0$ this is exactly the state-copy rule.

Here is the induction step with $n = 2$ and $m = 3$:



Exercise 4