

Circuit Drawing Tips

Wilfrid Laurier University

Terry Sturtevant

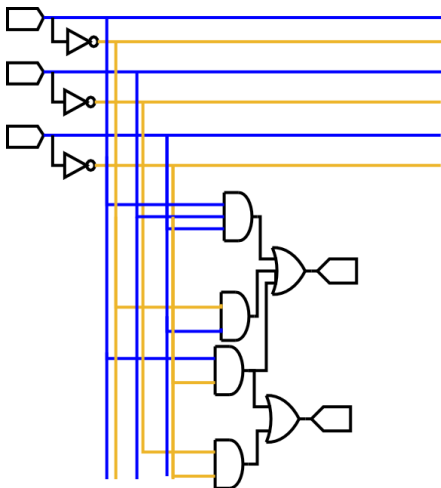
Wilfrid Laurier University

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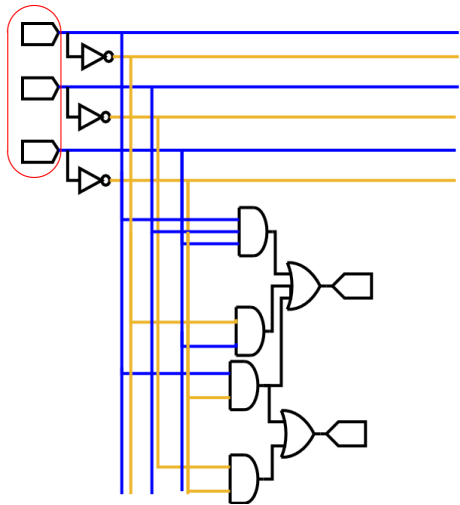
General Layout

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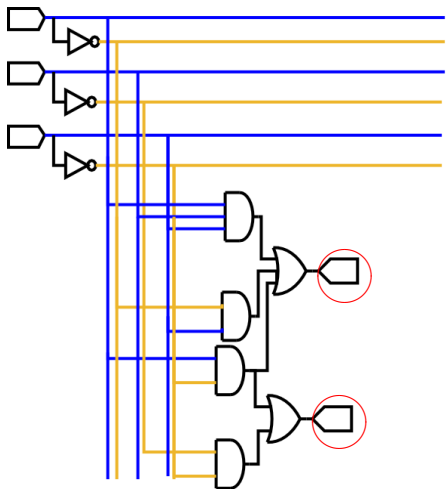
- How you draw a circuit can determine how easy it is to debug.



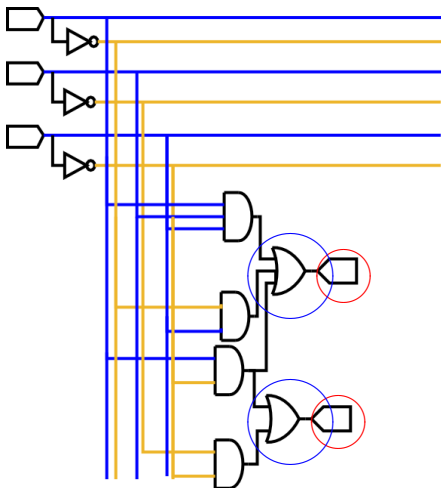
Here is a typical SOP (sum of products) circuit.



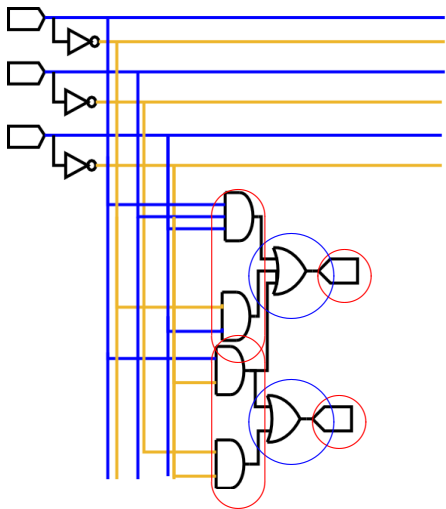
It has 3 inputs



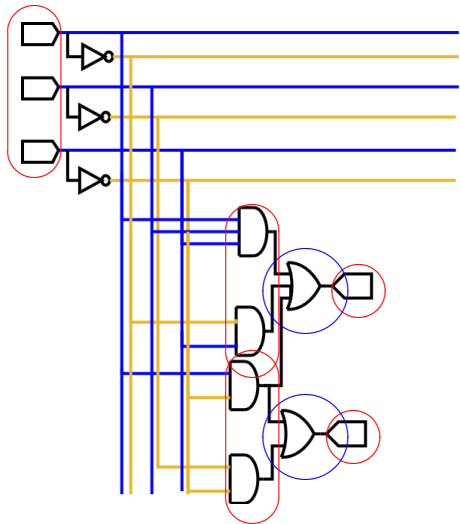
and two outputs.



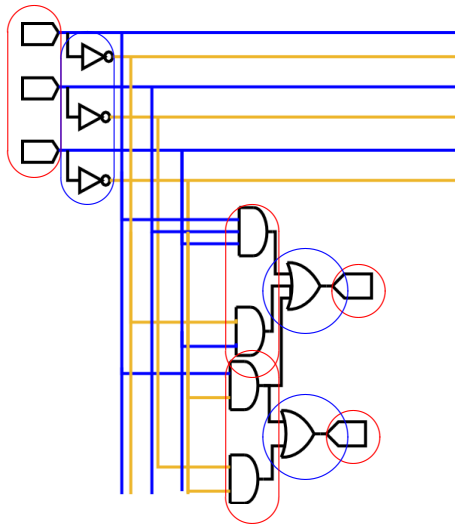
Each output is a **sum**



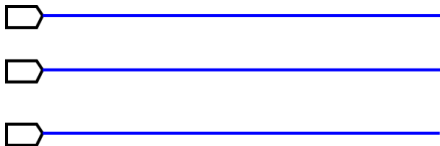
of products



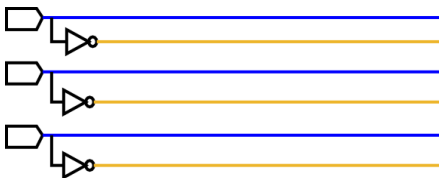
of its **inputs**



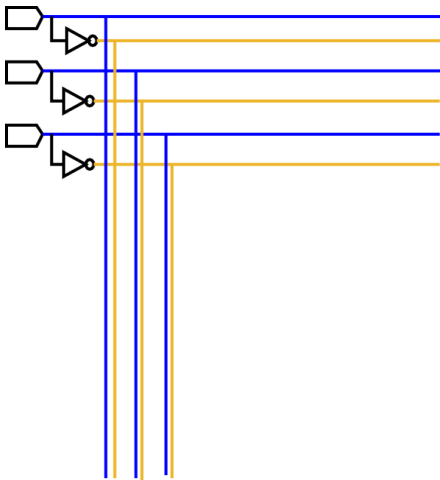
or their **inverses**.



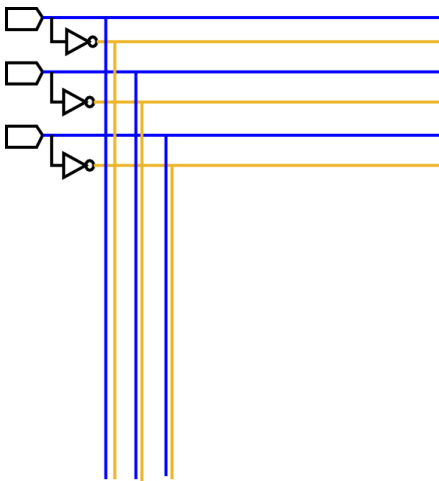
Start with the inputs at the *top left* and draw wires across the page.



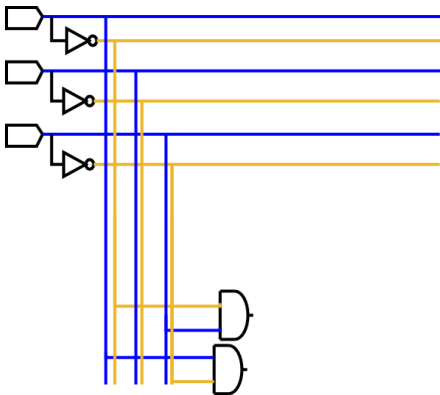
For each input, add an inverter as shown and add wires, as with the inputs.



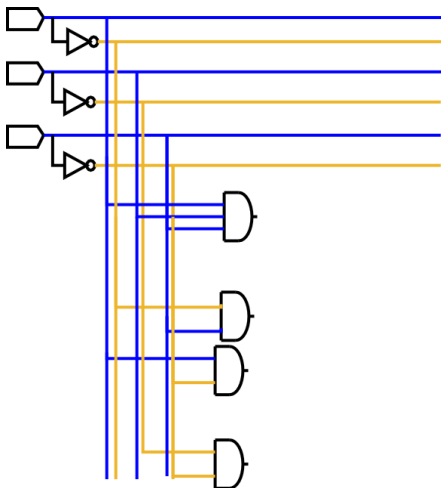
Drop down wires from inputs and inverses.



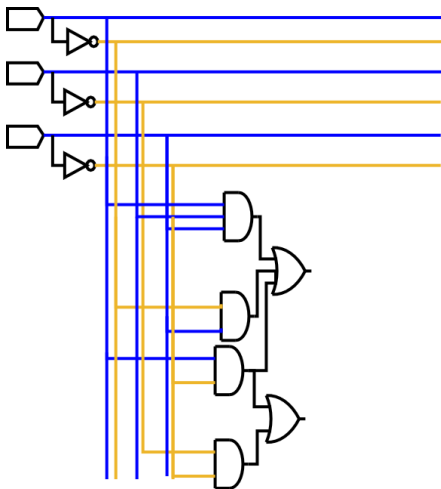
Placed in order and spaced as shown simplifies picking the right one without having to trace it back.



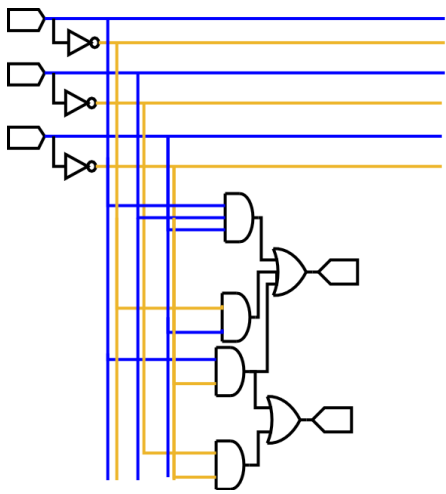
Many products will use some inputs and some inverses.



Continue until you have created all of the required product terms.



Sum the product terms for each output.



Add and label each output.

Repeated Terms

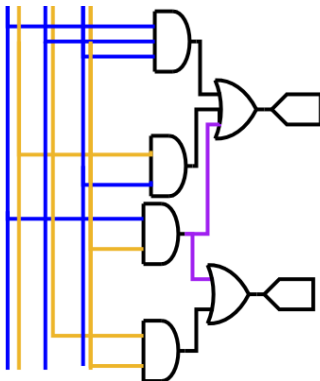
Repeated Terms

Sometimes the same logical term shows up in the equations for multiple outputs.

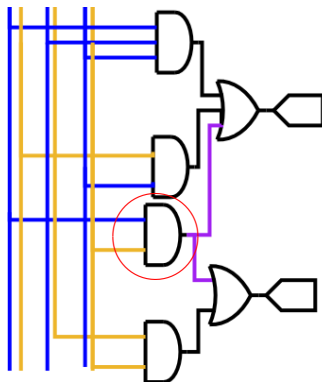
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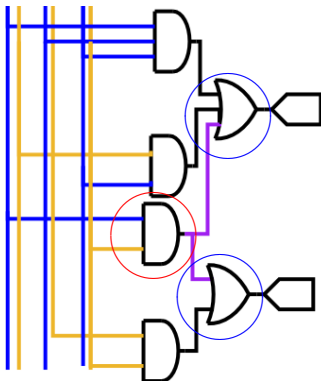
This makes drawing the circuit easier.



Here is a repeated term.



Here is a repeated term.



Note that you only need to *create* a product term once, but you can *use* it as many times as you need.

Unused Inputs

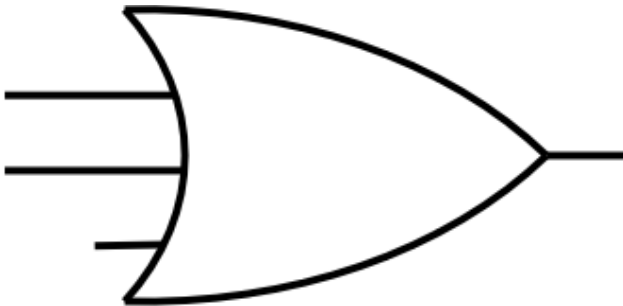
Unused Inputs

Occasionally you need a certain number of inputs to a gate, but no gate exists with that number of inputs.

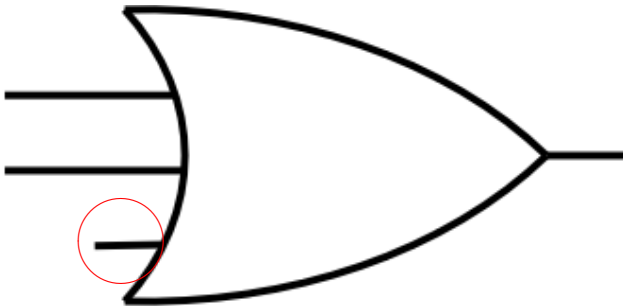
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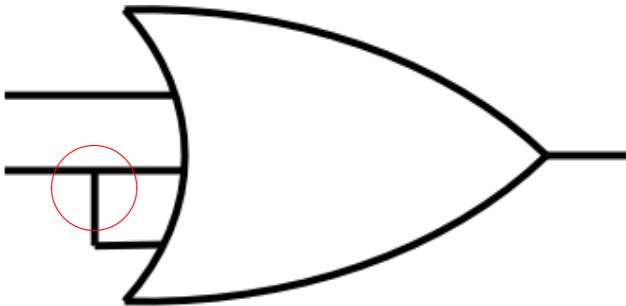
This is no problem if you have gates available with *more* than that number of inputs.



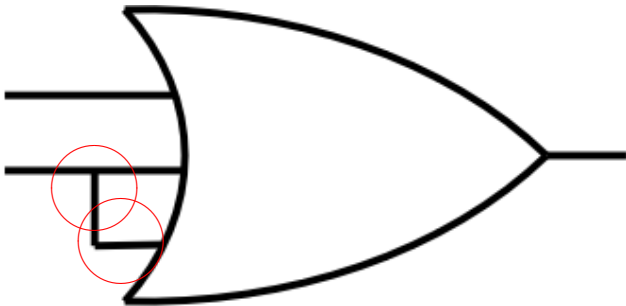
Here is a gate with an extra input.



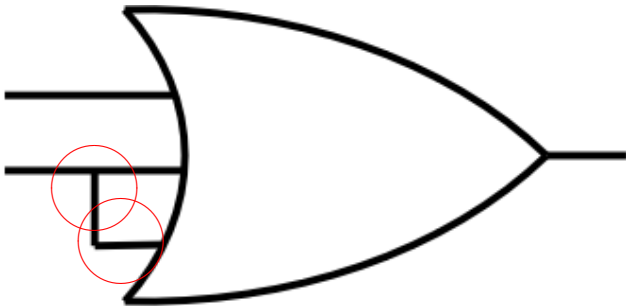
Here is a gate with an extra input.



It has been tied to one of the other inputs.



Whether the gate is an AND or an OR, two inputs tied together will be the same as a single input.



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$$A \times A \equiv A; \quad A + A \equiv A$$