Circuit Drawing Tips
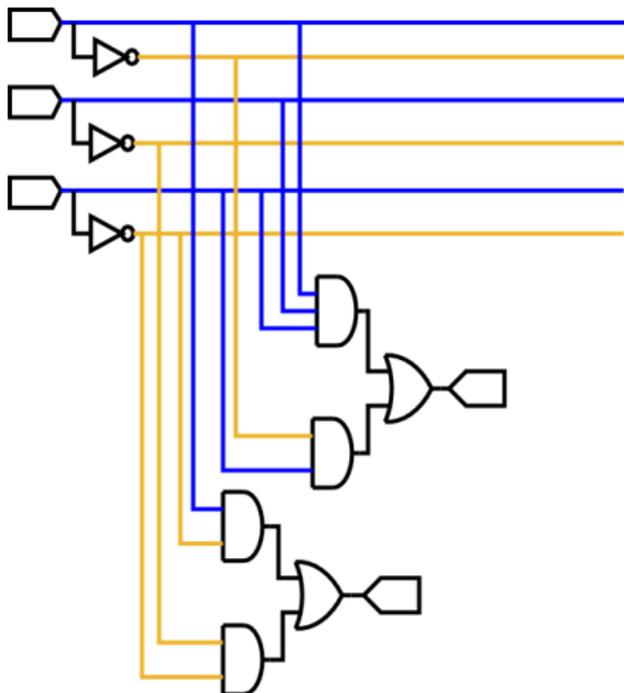# Wilfrid Laurier University

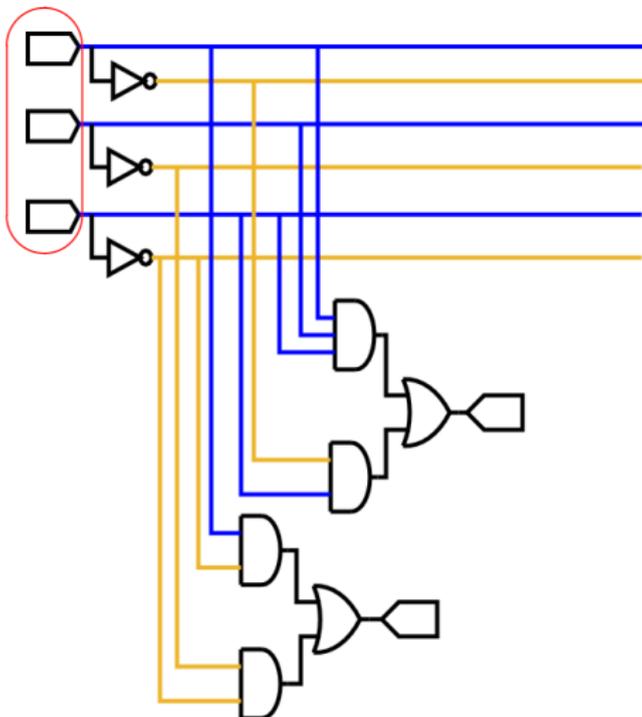## Terry Sturtevant

Wilfrid Laurier University

March 1, 2012

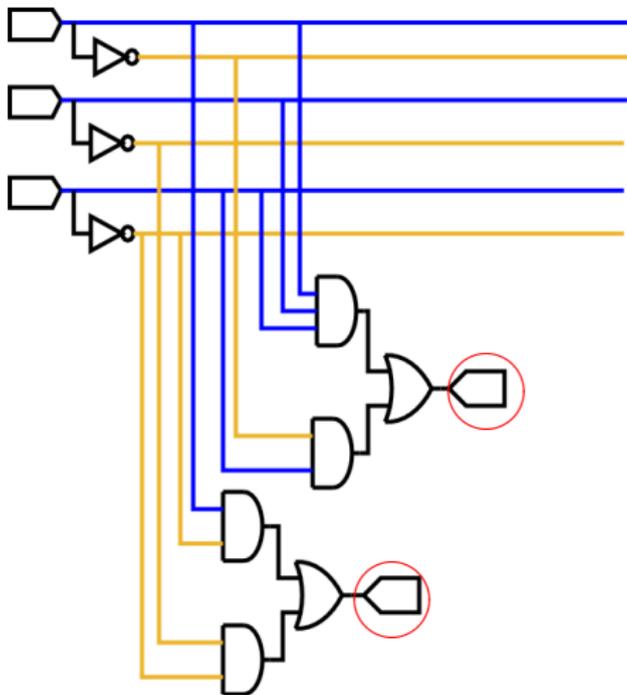# General Layout

General Layout

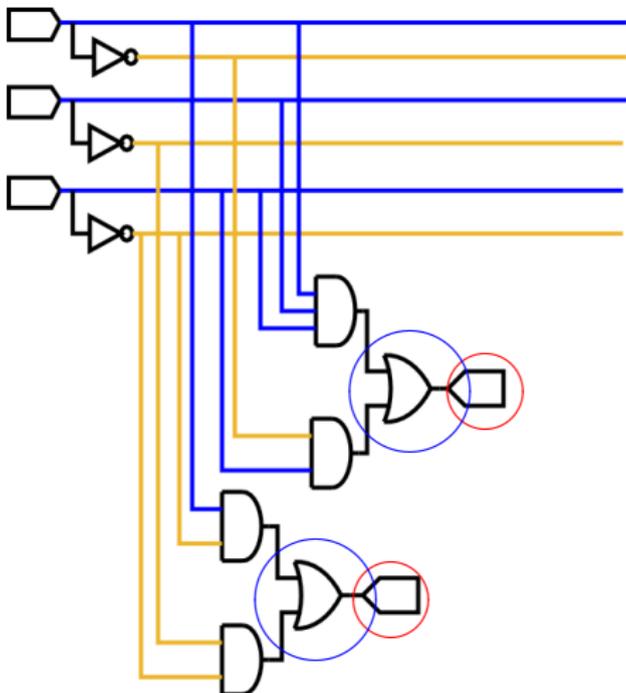- How you draw a circuit can determine how easy it is to debug.

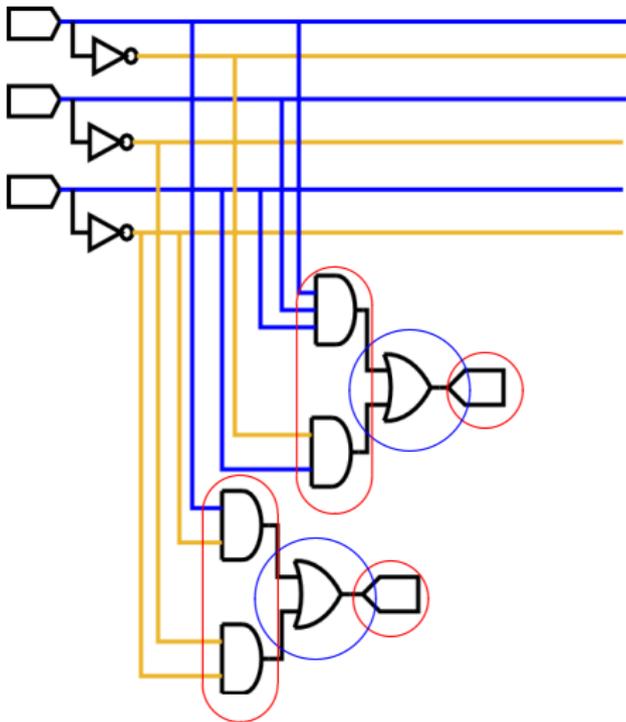Here is a typical SOP (sum of products) circuit.

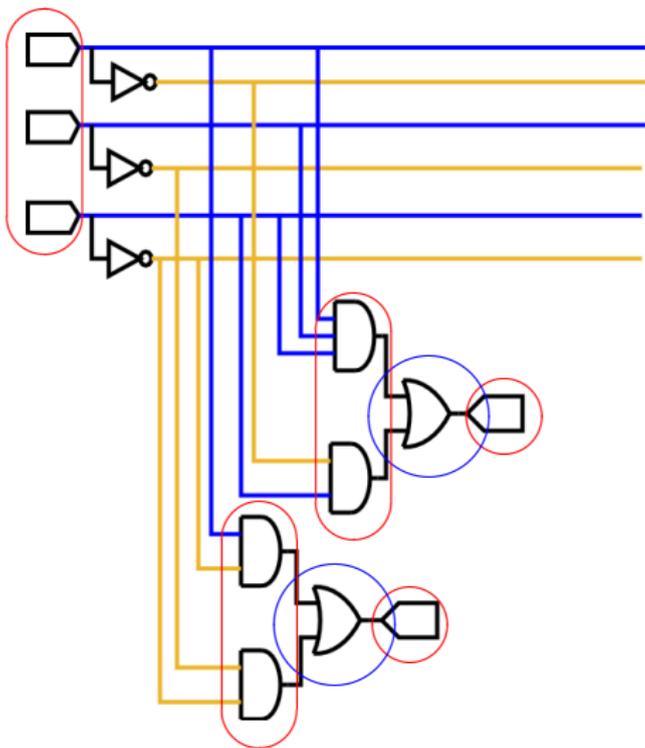It has 3 inputs

and two outputs.

Each output is a **sum**

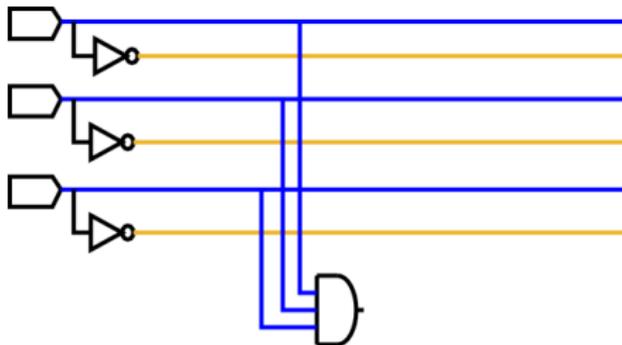of **products**

of its **inputs**
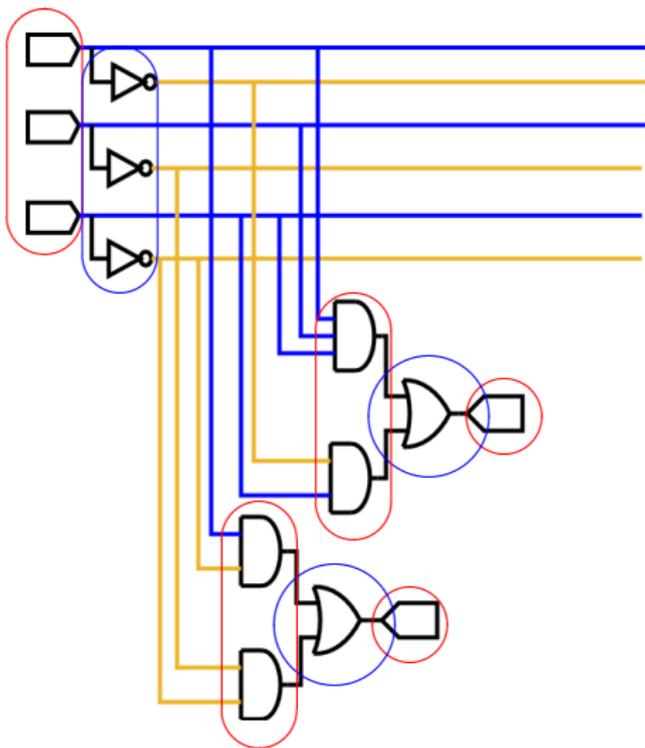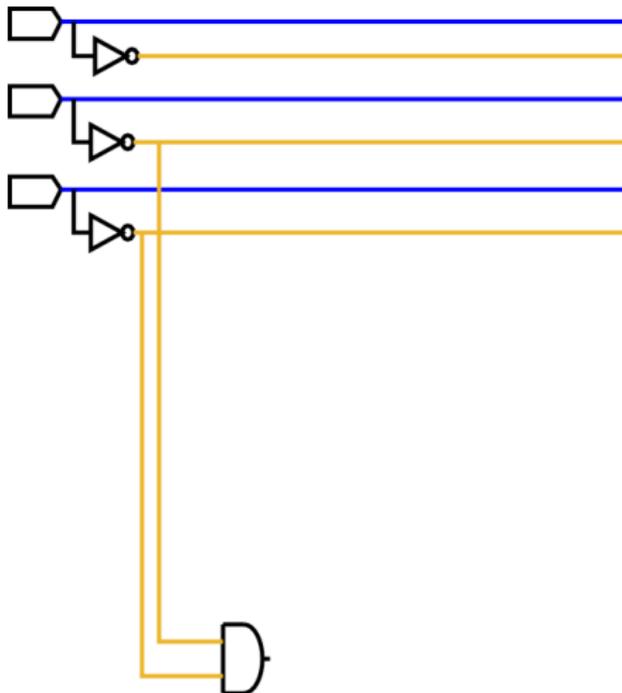
or their **inverses**.
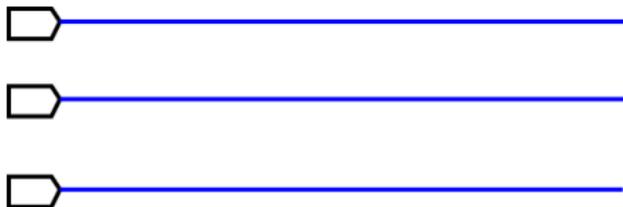
Start with the inputs at the *top left* and draw wires across the page.
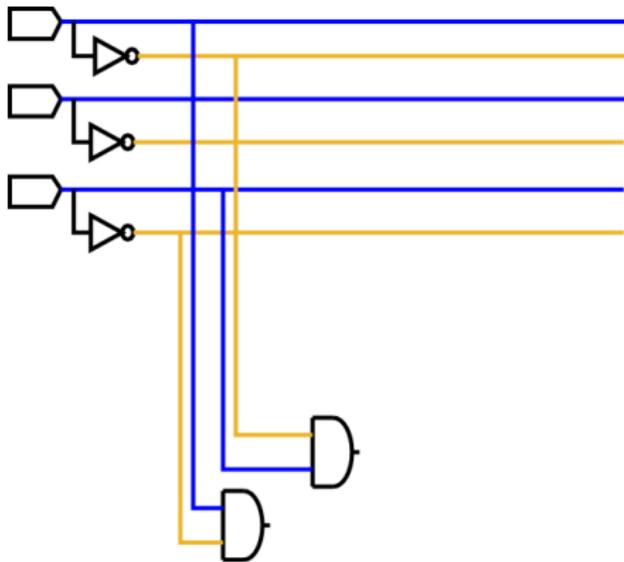
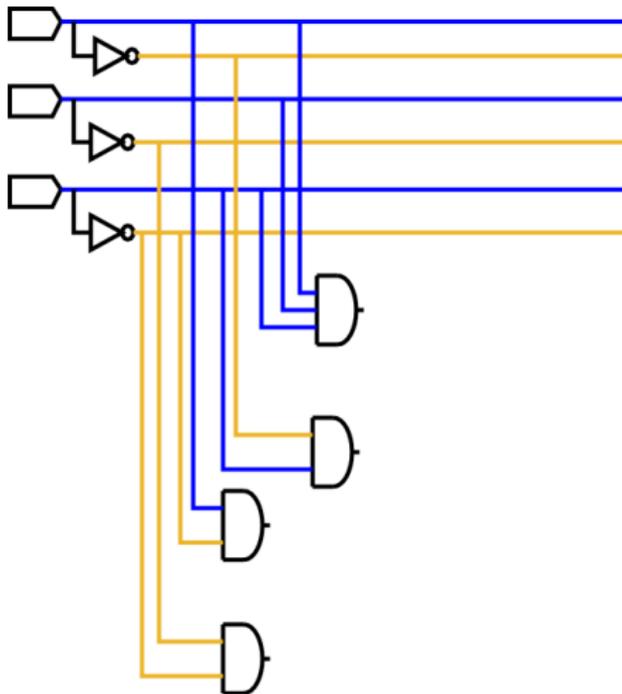For each input, add an inverter as shown and add wires, as with the inputs.

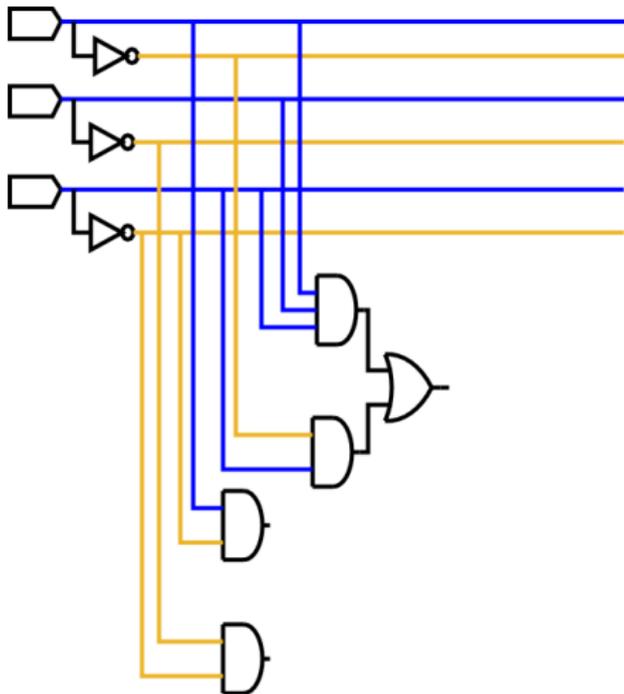Drop down wires from inputs to make product terms.

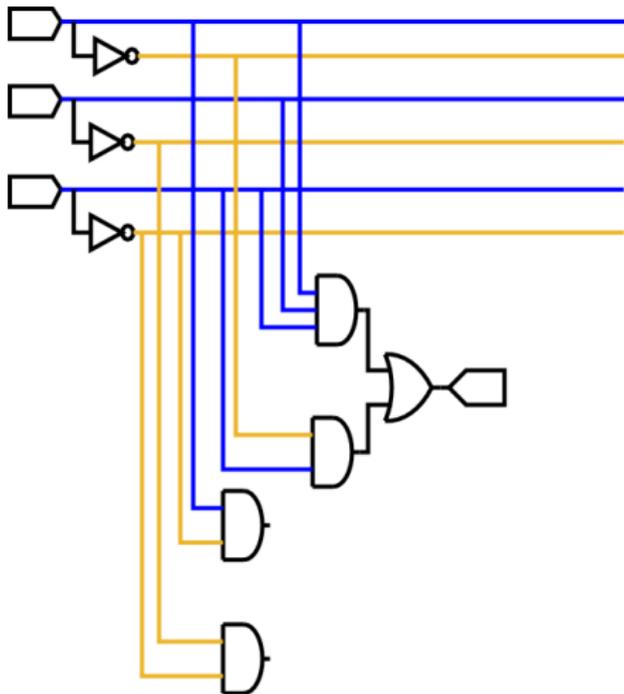Inverses of inputs can have drop down wires as well.

Many products will use some inputs and some inverses.

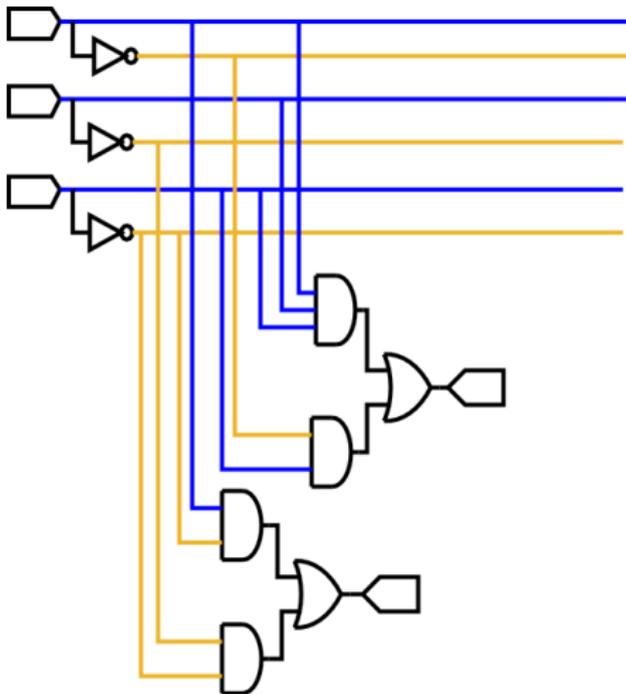Continue until you have created all of the required product terms.

Sum the product terms for each output.

Add and label each output.
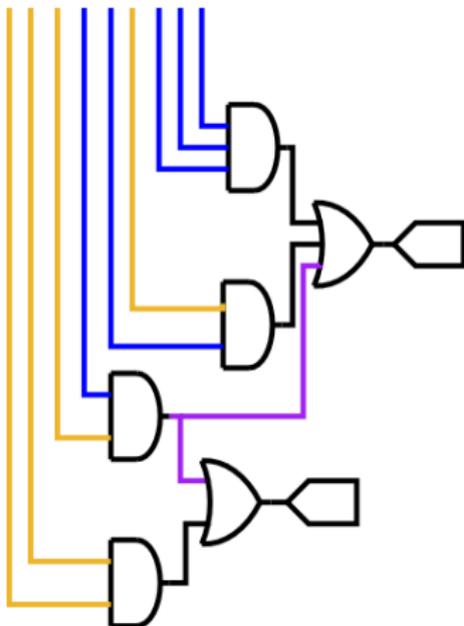
Repeat until you're done.

Repeated Terms

Repeated Terms

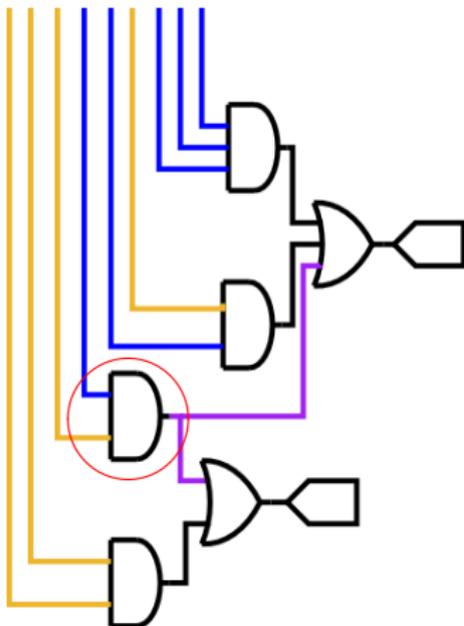Sometimes the same logical term shows up in the equations for multiple outputs.

Repeated Terms

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

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.
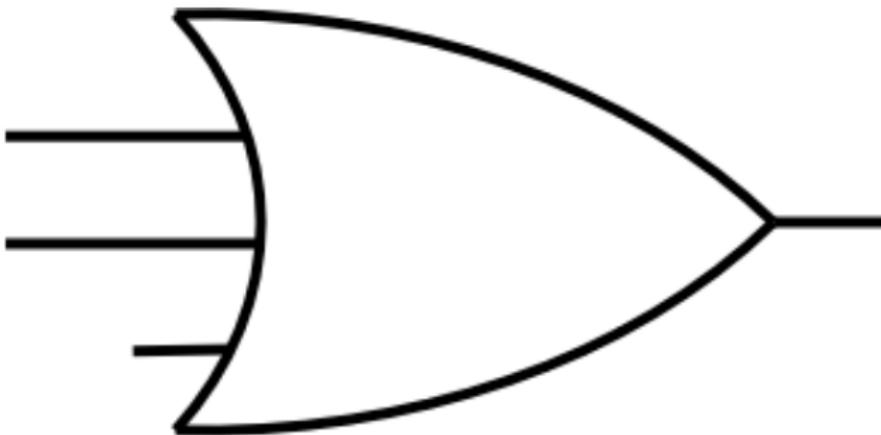
Unused Inputs

Unused Inputs

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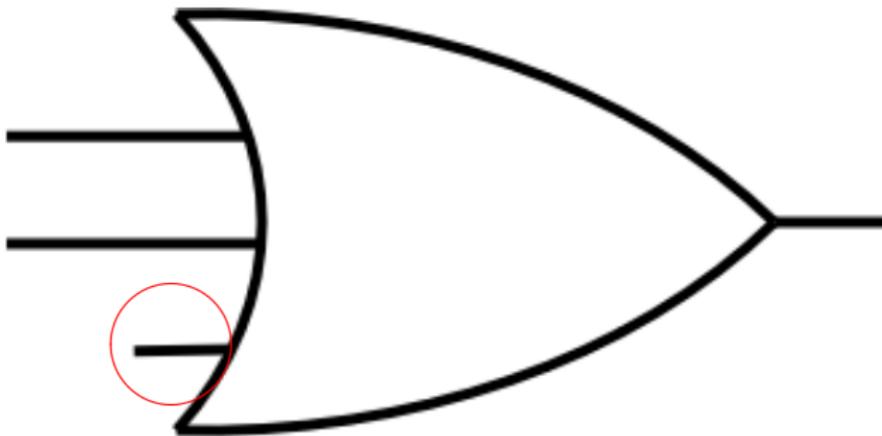
Unused Inputs

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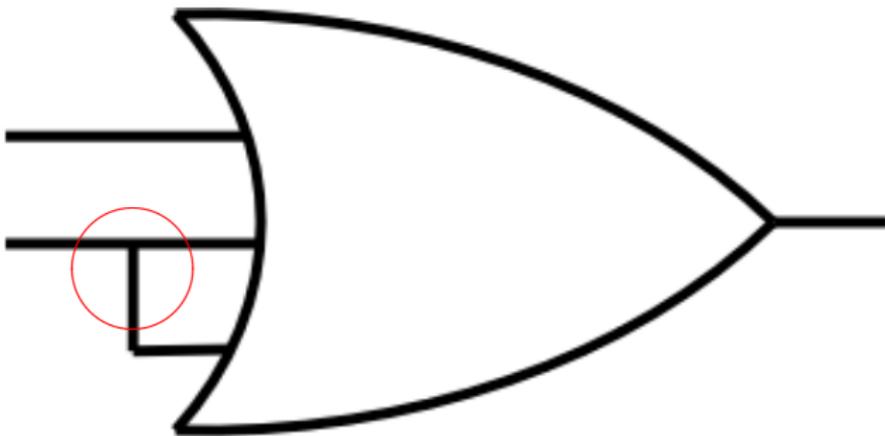but no gate exists with that number of inputs.

This is no problem if you have gates available with *more* than
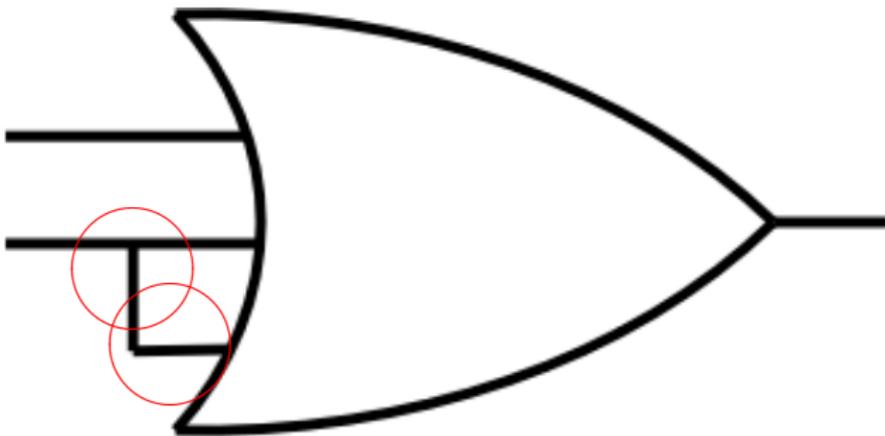that number of inputs.
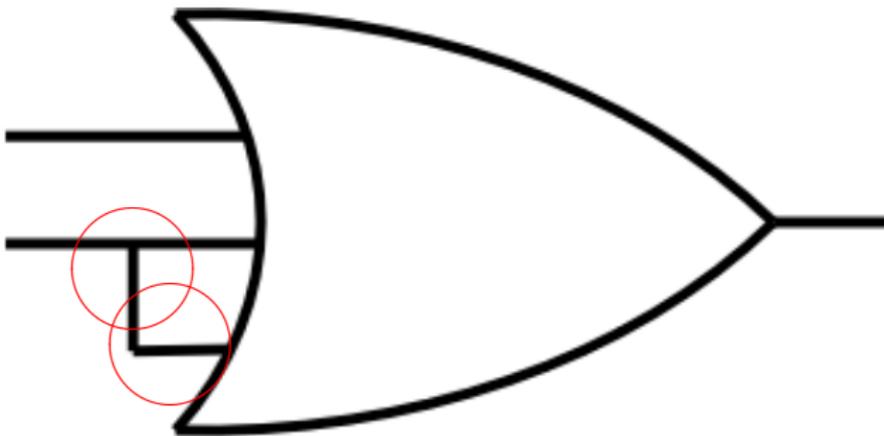
Here is a gate with an extra input.

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.

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

$A \times A \equiv A; \qquad A + A \equiv A$