

## The additive inverse of complex numbers

1. Suppose we have a circuit with a single capacitor represented by  $-5j$ . What would be the complex number representing an inductor that would have the opposite impedance? Recalling that with 60 Hz, the inductor with  $L$  henrys is represented by  $377Lj$ , how many henrys would this inductor have? Find this to four significant digits.
2. If you combine the capacitor and the inductor in Question 1 in series, what is the resulting impedance of the circuit. Would this be any different than just replacing this circuit with a wire? This would be called a [\*short circuit\*](#).
3. Suppose you have a circuit consisting of a resistor and an inductor represented by  $3 + 4j$ . Is it possible to combine this circuit with another circuit of resistors, inductors or capacities such that combining the two together in series also results in a short circuit? Why or why not?

Why do nanotechnology engineers care about capacitance and inductance? Boundaries between two phases are likely to exhibit characteristics that significantly differ from the material that they are bounding, and due to the differing electromagnetic properties of these materials, the boundary may exhibit electromagnetic properties that neither of the materials themselves have, including the ability to either store charge (capacitance) or maintain electron flow (inductance). For example, one should never connect stainless steel and aluminium, as the potential resulting transfer of electrons in the presence of an electrolyte may lead to [galvanic corrosion](#).