TOOL: At a any particular frequency, ω_S, a circuit consisting of only L's and C's is equivalent to a single L or C.

LEMMA: We may place an appropriate L or C in parallel or series with a circuit consisting of only L's and C's to create a resonance at any particular frequency, ω_S.

TOOL: Given an L in series with a C with resonant frequency ω_O, at any particular frequency, ω_S, the L and C are equivalent to:

1) A single C if $\omega_S < \omega_O$
2) A wire if $\omega_S = \omega_O$
3) A single L if $\omega_S > \omega_O$

TOOL: Given an L in parallel with a C with resonant frequency ω_O, at any particular frequency, ω_S, the L and C are equivalent to:

1) A single L if $\omega_S < \omega_O$
2) An open circuit if $\omega_S = \omega_O$
3) A single C if $\omega_S > \omega_O$

COMMENT: A circuit consisting of only L's and C's looks like a single L or C at one frequency, ω_S, because all the impedances are purely imaginary. Thus, the impedance of the entire circuit, z_{tot}, is purely imaginary.

If z_{tot} is positive imaginary, then $z_{tot} = j\omega_S L$ for some L.

If z_{tot} is negative imaginary, then $z_{tot} = -j/(\omega_S C)$ for some C.

TOOL: Summary of *LC* behavior:

LC	$\omega = 0$	$\omega < \omega_o$	$\omega = \omega_o$	$\omega > \omega_o$	$\omega \to \infty$
series	– – (open)	$-jX$	—— (wire)	jX	– – (open)
parallel	—— (wire)	jX	– – (open)	$-jX$	—— (wire)