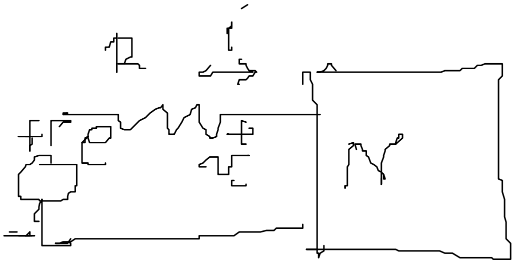
04/30/02

Passive circuits — n-ports



$[v, i] \in N$; $E(t) = \int_{-\infty}^{t} v(\tau)\, i(\tau)\, d\tau$

$E(t) = \int_{-\infty}^{t} v^T(\tau)\, i(\tau)\, d\tau = \int_{-\infty}^{t} p_{in}(\tau)\, d\tau$

passive if $E(t) \geq 0$ for all t & all $[v, i] \in N$

$t \to \infty$, $E(\infty) = \langle v(\tau), i(\tau) \rangle_\tau$

$e = v + i = 2v$ ~~choose~~ $R = 1\Omega$

$2v^r = v - i = v - Ri \Rightarrow$ reflected voltage

$2v^i = \quad e = v + Ri \Rightarrow$ incident voltage

add : $v = v^i + v^r$, $Ri = v^i - v^r = i$, $R = 1\Omega$

$E(\infty) = \langle v, i \rangle = \langle v^i + v^r, v^i - v^r \rangle$

$= \langle v^i, v^i \rangle - \langle v^i, v^r \rangle + \langle v^r, v^i \rangle$

$- \langle v^r, v^r \rangle$

but $\langle v^i, v^r \rangle = \langle v^r, v^i \rangle$