Conjugate Matching Networks

$Rsource := 50 \cdot ohm$ Real part of impedance to match to

$Xsource := -4 \cdot ohm$ Imaginary part of impedance to match to

$Rload := 19.3 \cdot ohm$ Real part of load

$Xload := -64 \cdot ohm$ Imaginary part of load

$F := 15 \cdot MHz$??? it if Farada too

$R_s := Rsource$ $X_s := Xsource$ $R_l := Rload$ $X_l := Xload$

$$Conj1(R_s, X_s, R_l, X_l, F) := \left| \begin{array}{l} Q \leftarrow \sqrt{\left[\dfrac{R_s \cdot \left[1 + \left(\dfrac{X_s}{R_s} \right)^2 \right]}{R_l} \right] - 1} \\ Xseries \leftarrow Q \cdot R_l - X_l \\ XNseries \leftarrow -Q \cdot R_l - X_l \\ Xparallel \leftarrow -\dfrac{\left(R_s^{\,2} + X_s^{\,2} \right)}{Q \cdot R_s + X_s} \\ XNparallel \leftarrow -\dfrac{\left(R_s^{\,2} + X_s^{\,2} \right)}{-Q \cdot R_s + X_s} \\ \begin{pmatrix} Q \\ \dfrac{Xseries}{ohm} \\ \dfrac{Xparallel}{ohm} \end{pmatrix} \end{array} \right.$$

Xs and Xp may be either a capacitor or inductor depending on the input values. How to get the outputs to display proper units (uH or pF) depending on the particular matching case?
Need to return vector with elements of all same dimension, so can't return something with possibly three different dimensions. Here, the mofdification gives the two impedances as dimensionless values in ohms (to be restored later).

scalar function which returns either a capacitance or inductance, depending on sign of reactance X. Apply independently to each x.

$$elemval(X, f) := \left| \begin{array}{l} \text{"X \& f should have proper dimensions (impedance and freq)"} \\ elem \leftarrow \dfrac{X}{2 \cdot \pi \cdot f} \quad \text{if} \quad \dfrac{X}{ohm} \ge 0 \\ elem \leftarrow \dfrac{-1}{2 \cdot \pi \cdot f \cdot X} \quad \text{otherwise} \\ elem \end{array} \right.$$

$x := \text{Conj1}(R_s, X_s, R_l, X_l, F)$

examples

$\text{elemval}(40 \cdot \text{ohm}, F) = 4.244 \times 10^{-7}\,H$

$\text{elemval}(-40 \cdot \text{ohm}, F) = 2.653 \times 10^{-10}\,F$

$Q := x_0$ $\quad Q = 1.268$

$\text{Xseries} := x_1 \cdot \text{ohm}$ $\quad \text{Xseries} = 88.468\,\Omega$

$\text{Xparallel} := x_2 \cdot \text{ohm}$ $\quad \text{Xparallel} = -42.365\,\Omega$

$\text{series\_elem} := \text{elemval}(x_1 \cdot \text{ohm}, F)$ $\quad \text{series\_elem} = 9.387 \times 10^{-7}\,H$

$\text{par\_elem} := \text{elemval}(x_2 \cdot \text{ohm}, F)$ $\quad \text{par\_elem} = 2.505 \times 10^{-10}\,F$