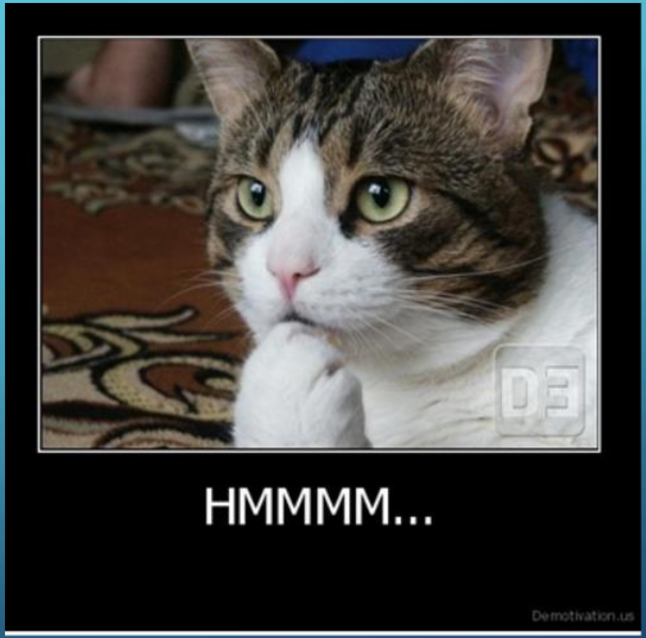
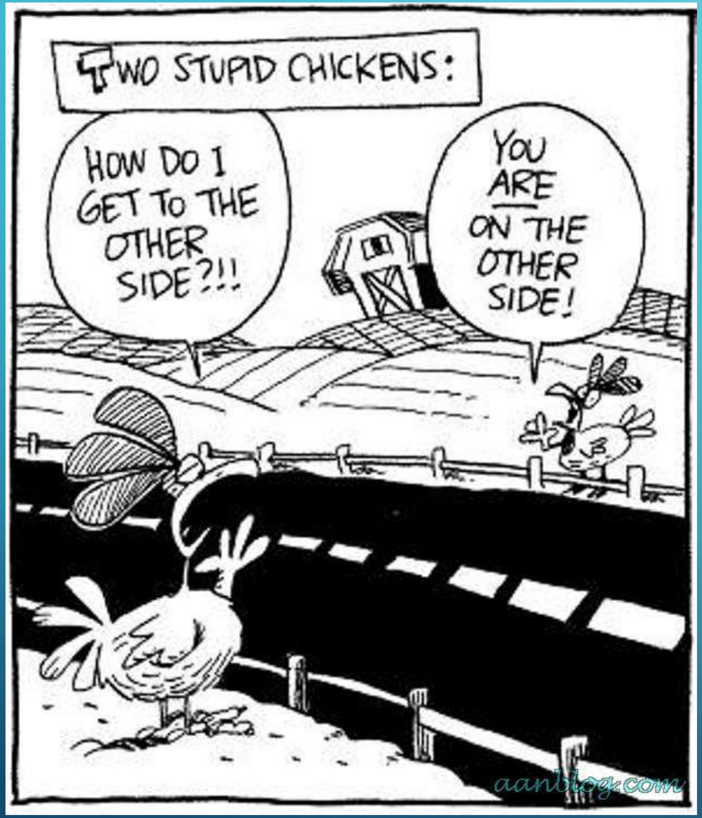
PARC
WHAT'S ALL THIS ABOUT IMPEDANCE MATCHING?



DAVE VE3OOI

DANGER WILL ROBINSON…



POWER TRANSFER & SIGNAL REFLECTION

Wikipedia

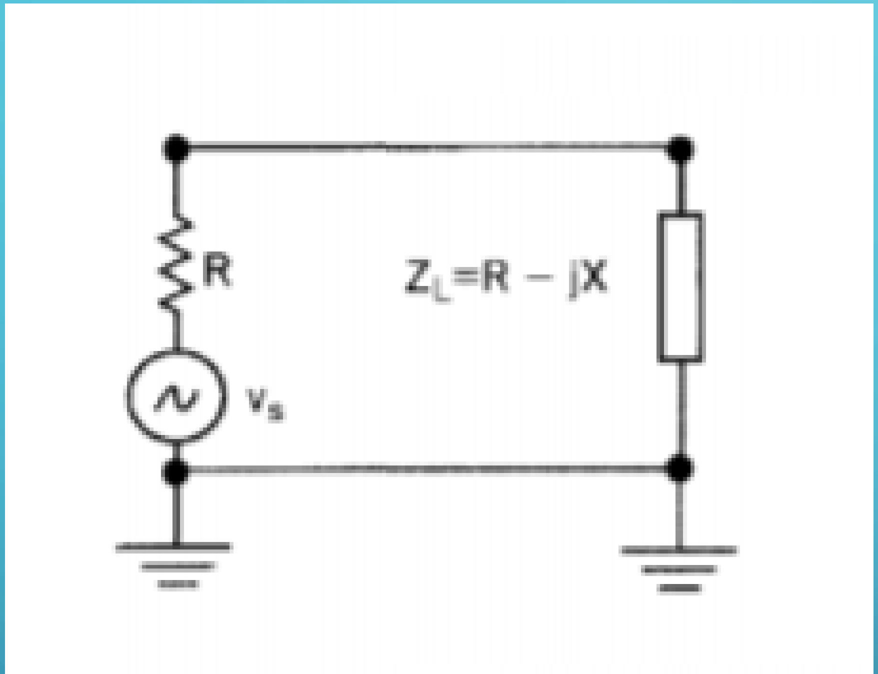
- Impedance matching is the practice of designing the input impedance of an electrical load or the output impedance of its corresponding signal source to ***maximize the power transfer*** or minimize signal reflection from the load

Maximum Power Transfer

- DC: Source Resistance is equal to Load Resistance
- AC: Source Impedance is equal to conjugate Load Impedance at a frequency
  - For two impedances to be complex conjugates their resistances must be equal, and their reactances must be equal in magnitude but of opposite signs (i.e. capacitive = inductive or resonance)

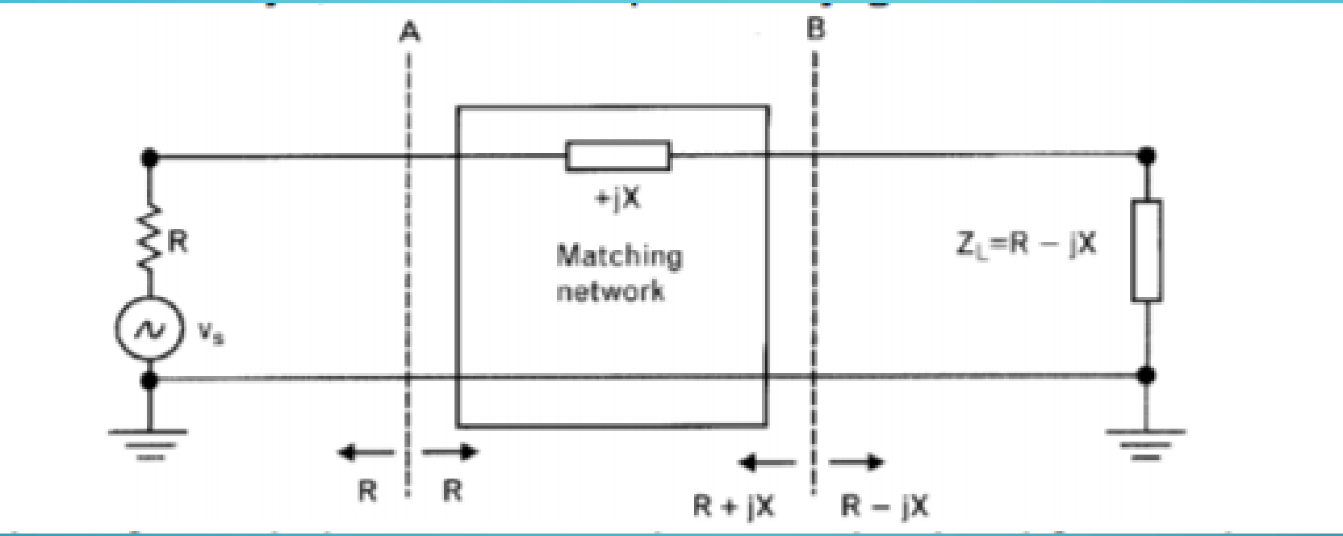
In some cases, low source can drive a high impedance
e.g. opamp: higher voltage delivered without high power dissipation

HUH? DUMB IT DOWN



Resistive Source Driving a Complex Load

HUH? DUMB IT DOWN

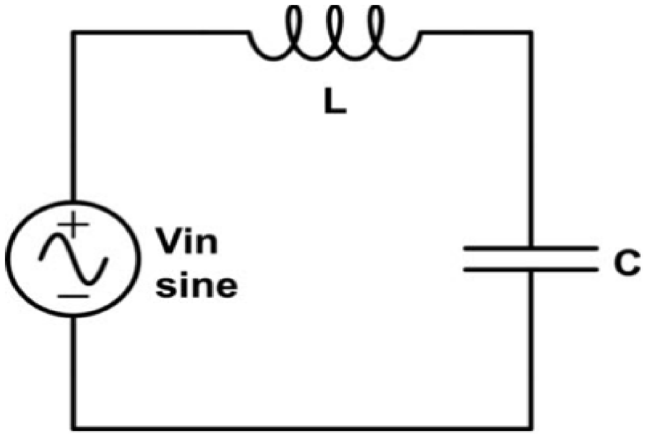


Note:
-Reactance is Capacitive
+Reactance is Inductive

Introduce a Matching Device to Introduce the Complex Conjugate

At point A, R = R, +jX cancels –jX (Life is good)

ANTENNA RESONACE?



Series LC Circuit Resonance

At one specific frequency, the two reactances X_L and X_C are the same in magnitude but reverse in sign. So this frequency is called the resonant frequency which is denoted by for the LC circuit.

Therefore, at resonance

$$X_L = -X_C$$

For f<f0, X_L << ($-X_C$). Thus, the circuit is capacitive

For f<f0, X_L>> ($-X_C$). Thus, the circuit is inductive

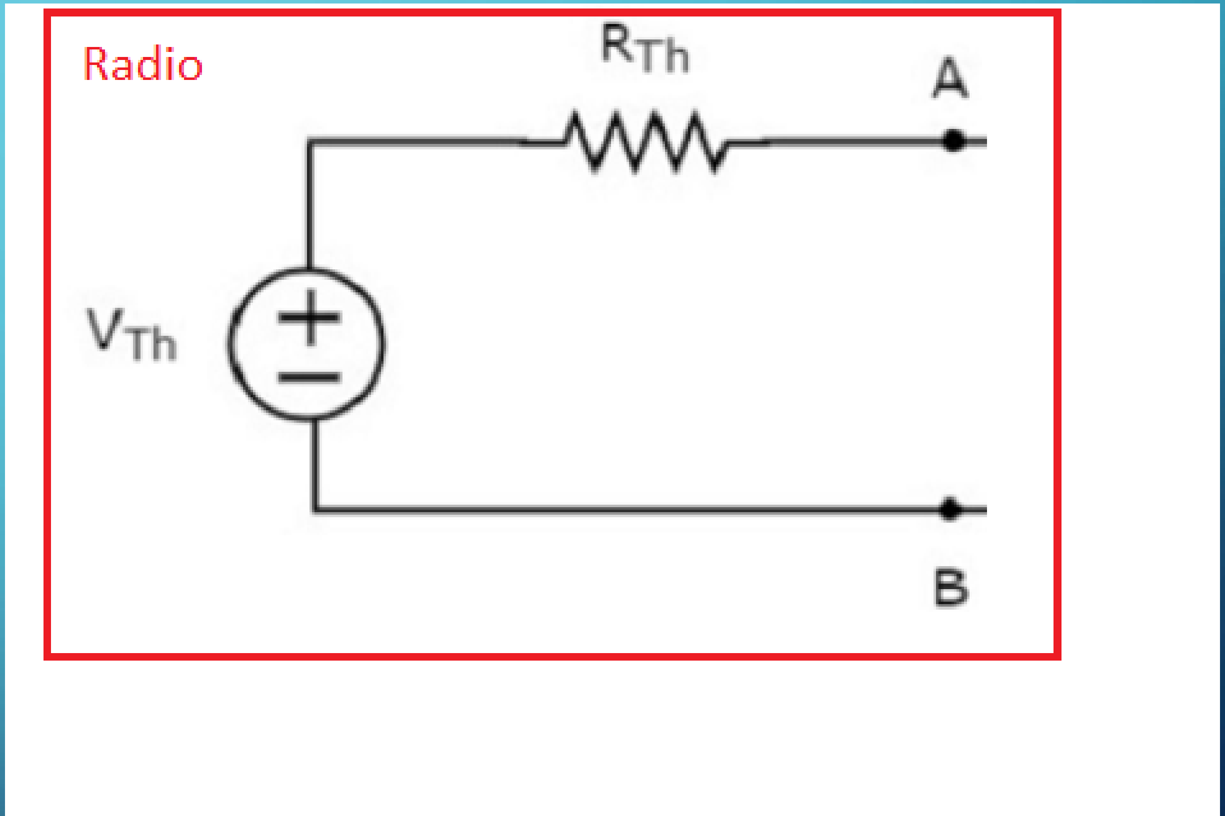
https://www.elprocus.com/

FOCUS ON MAXIMUM POWER TRANSFER

Ignore complex impedance mumbo jumbo

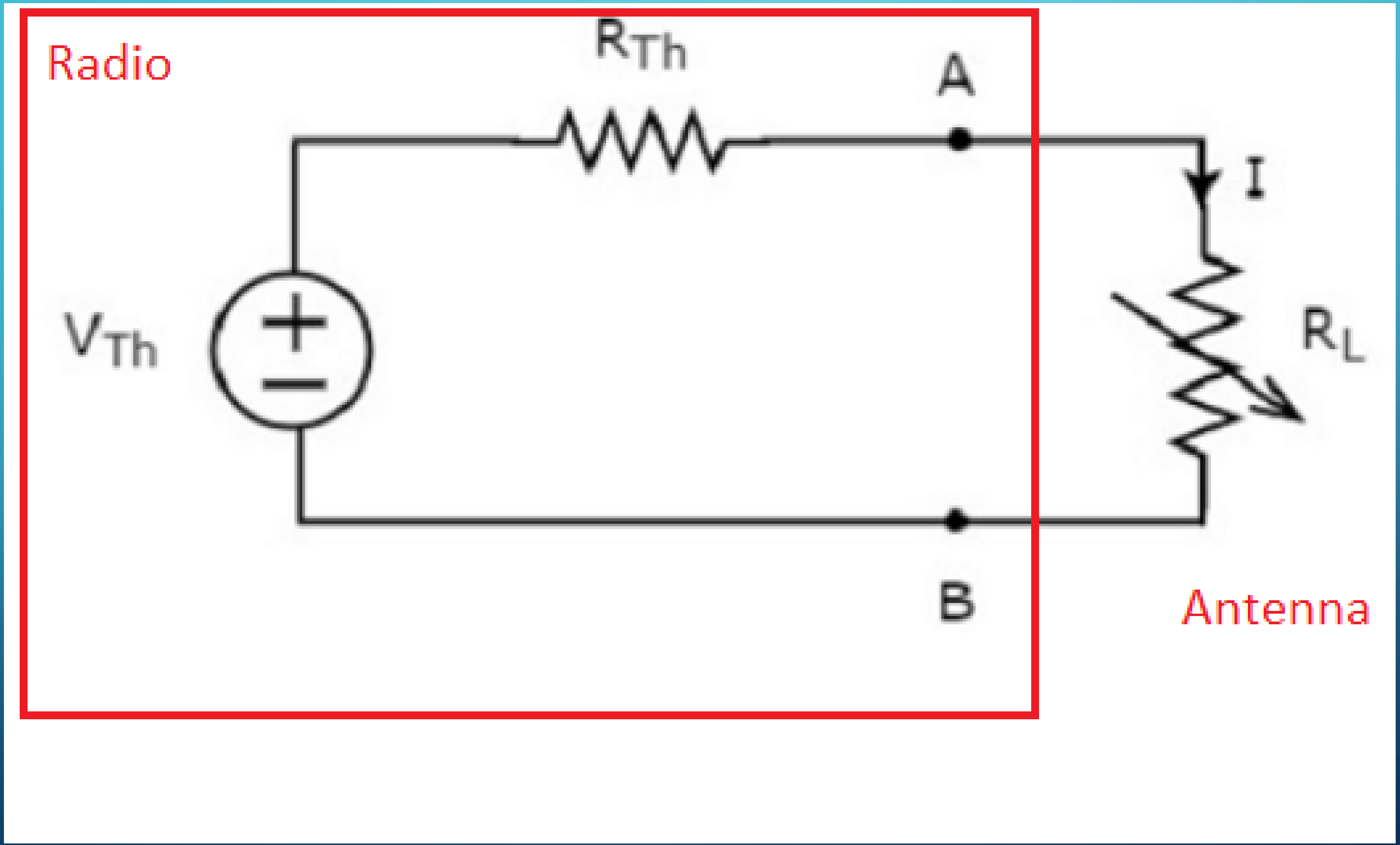
INTRODUCE SIMPLE RADIO

Radio output impedance is R_{th} = 50 Ohms

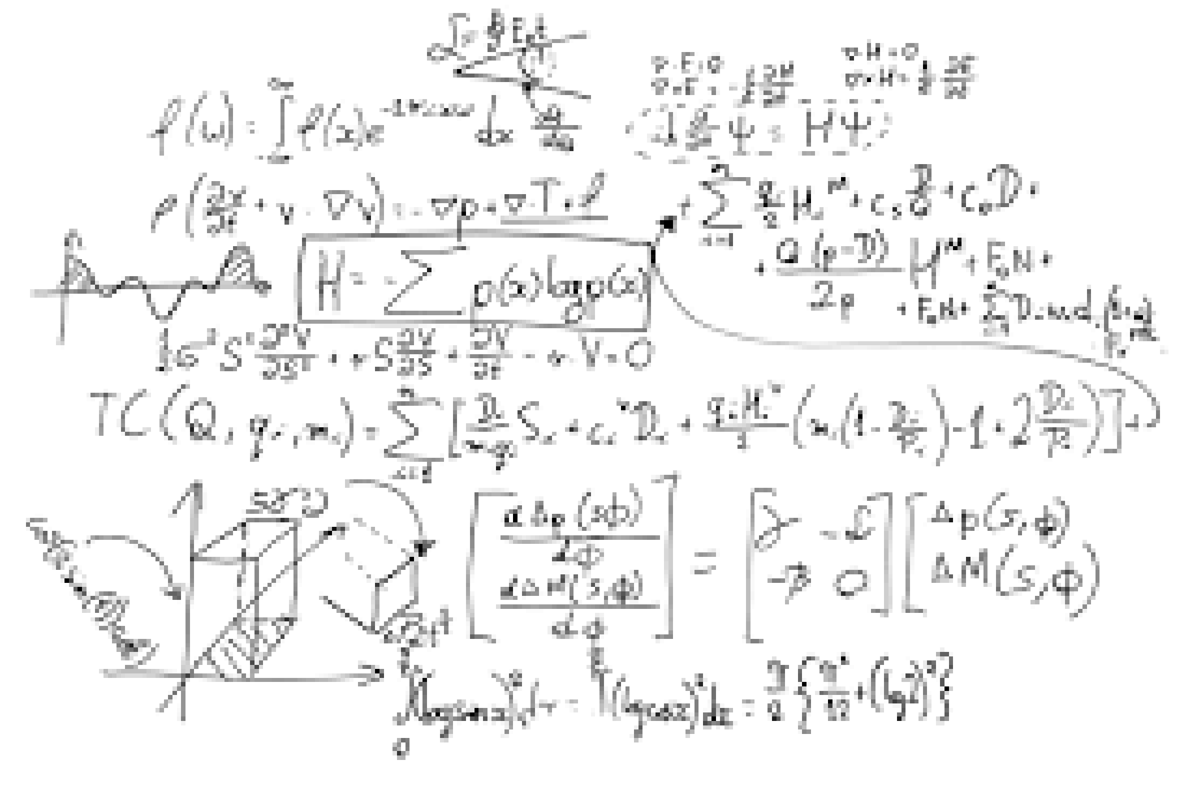


QUESTIONS?

SIMPLE RADIO CONNECTED TO SIMPLE ANTENNA

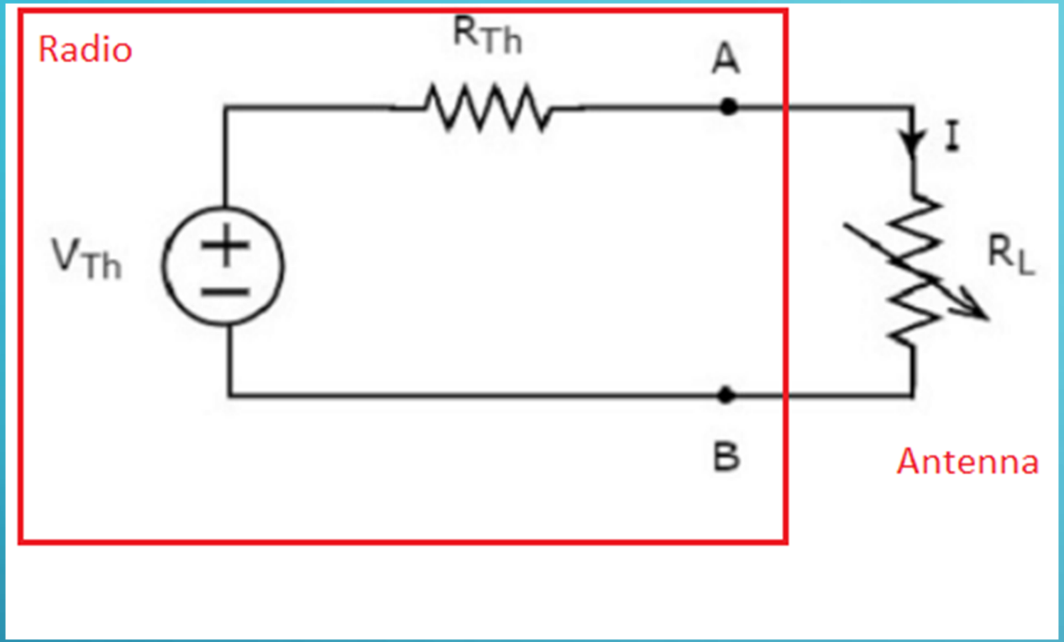


THE DREADED MATH…



"Quod Erat Demonstrandum"

THE DREADED MATH…



- Same current flows through both resistors
- Current will be Voltage divided by sum or both resistances
- Power into "antenna" is I^2*R (I-squared R)
- Did your brain melt?

The amount of power dissipated across the load resistor is

$$P_L = I^2 R_L$$

Substitute $I = \frac{V_{Th}}{R_{Th}+R_L}$ in the above equation.

$$P_L = \left(\frac{V_{Th}}{(R_{Th}+R_L)}\right)^2 R_L$$

PLOT THE POWER FORMULA

QUESTIONS?