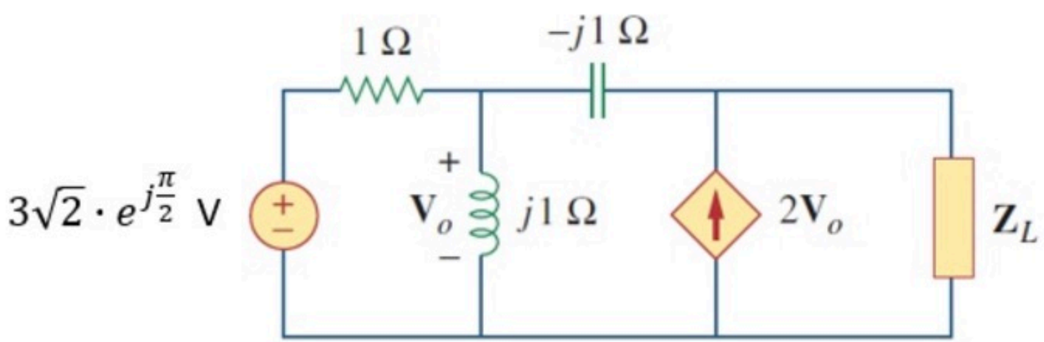
PP AC power 010

Unlimited Attempts.

Find the value of $\mathbf{Z_L} = a + jb$ that will receive the maximum amount of power



Given Variables:

. : . .

Calculate the following:

a (ohm) :

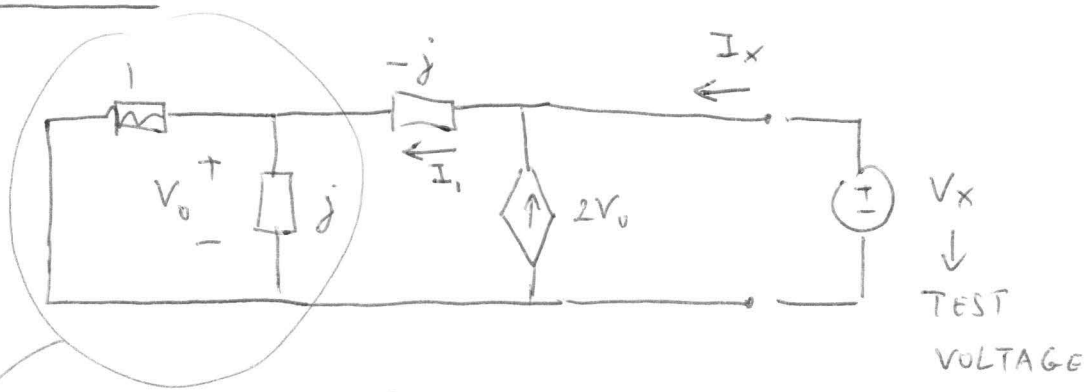
0.5 ✓

b (ohm) :

-0.5 ✓

Hint: Use a test source to find the ZTh.

FIND Z_{TH}:



$$Z_1 = \frac{1}{\frac{1}{1} + \frac{1}{j}} = \frac{j}{1+j} = \frac{j(1-j)}{2} = \frac{1+j}{2}$$

$$I_1 = \frac{V_x}{Z_1 - j} = \frac{V_x}{\frac{1-j}{2}}$$

$$V_0 = V_x \cdot \frac{Z_1}{Z_1 - j} = V_x \frac{(1+j)}{(1-j)}$$

$$I_x = I_1 - 2V_0 = \frac{2V_x}{1-j} - 2V_x \frac{(1+j)}{1-j} = V_x \frac{(-2j)}{1-j}$$

$$Z_{TH} = \frac{V_x}{I_x} = \frac{V_x(1-j)}{V_x(-2j)} = \frac{1-j}{-2j} = \frac{(1-j)\cdot j}{2} = \frac{1+j}{2}$$

MAX POWER: $Z_L = Z_{TH}^*$

$$\boxed{Z_L = 0.5 - 0.5j}$$