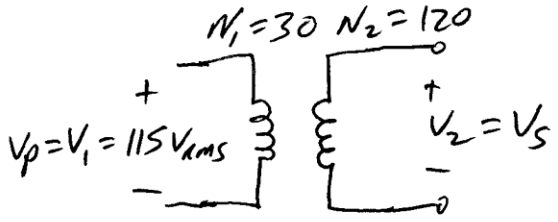
An ideal transformer has 30 turns on the primary and 120 turns on the secondary. (a) If the primary voltage is 115 V_{rms}, what is the secondary voltage if the secondary is assumed to be open-circuited? (b) Is this a step-up or step-down transformer? (c) If the secondary is now connected to a resistive load of 1.5 kΩ, what are the currents in the primary and secondary windings?



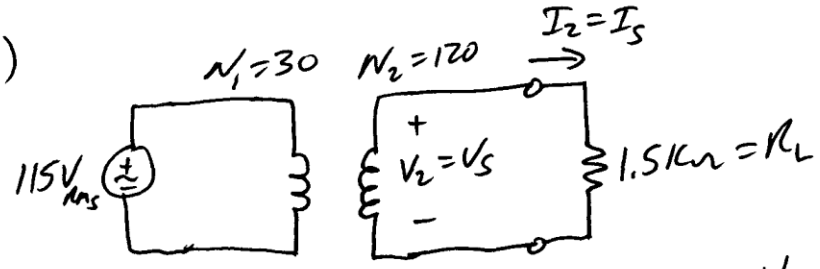
a) From Dr. Whites Notes (lecture 9 Ideal Transformer)

$$\frac{V_1(t)}{V_2(t)} = \frac{N_1}{N_2} \Rightarrow V_2 = V_s = \frac{N_2}{N_1} V_1 = \frac{120}{30}(115)$$

$$V_2 = V_s = 460\ V_{rms}$$

b) Since $V_2 = V_s > V_1 = V_p$, this is a step-up transformer

c)



By Ohm's Law, $I_2 = I_s = \frac{V_2}{R_L} = \frac{460\ V_{rms}}{1500\ \Omega}$

$$I_2 = I_s = 0.30\overline{6}\ A_{rms} = 306.\overline{6}\ mA_{rms}$$

From Dr. Whites notes, $\frac{I_1(t)}{I_2(t)} = \frac{N_2}{N_1}$.

$$I_1 = I_p = \frac{120}{30}(0.30\overline{6}\ A_{rms})$$

$$I_1 = I_p = 1.22\overline{6}\ A_{rms}$$