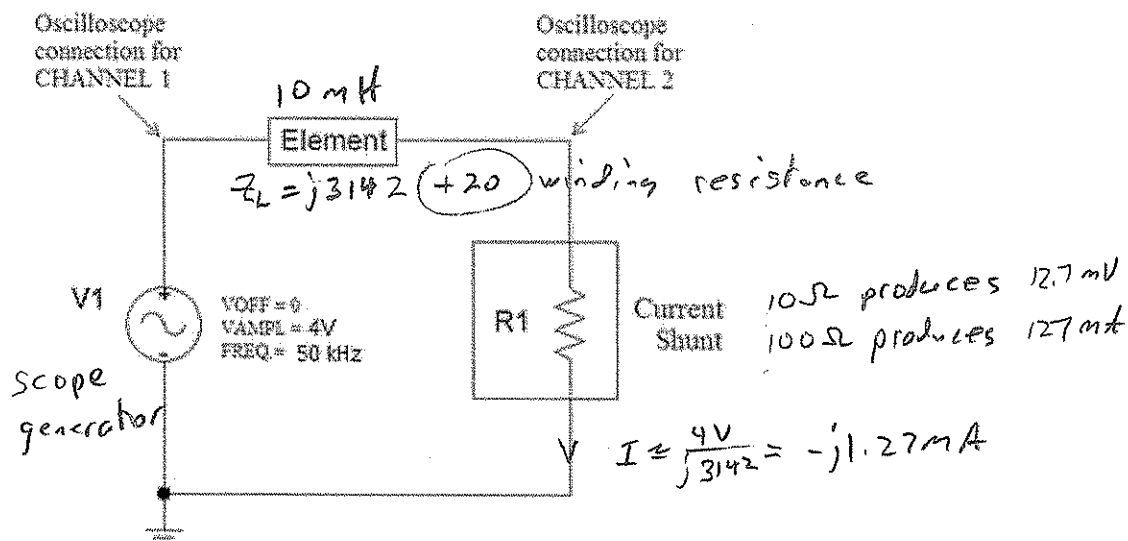


GTA

**ECE 3074 Lab Validation Instructions**  
**Experiment 22: Introduction to Phasors**  
**Deadline: 8pm on Monday, January 30, 2012**

**Instructions for the Validation:**



Construct the circuit from Figure 2 from Experiment 22 on the ANDY board.  
 Bring the circuit on the ANDY board, the digital multimeter (DMM), and oscilloscope to the Open Electronics Laboratory (Rooms 219 and 222 Whittemore), which will be abbreviated as OpEL in the future.

The grade for Lab 1 Validation will be based upon two sets of criteria listed below.  
 Proper Circuit Construction Techniques – 30%:

1. Wiring is neat.
2. No wire is more than an inch above the breadboard.
3. A red wire is used for power.
4. A black wire is used for ground.

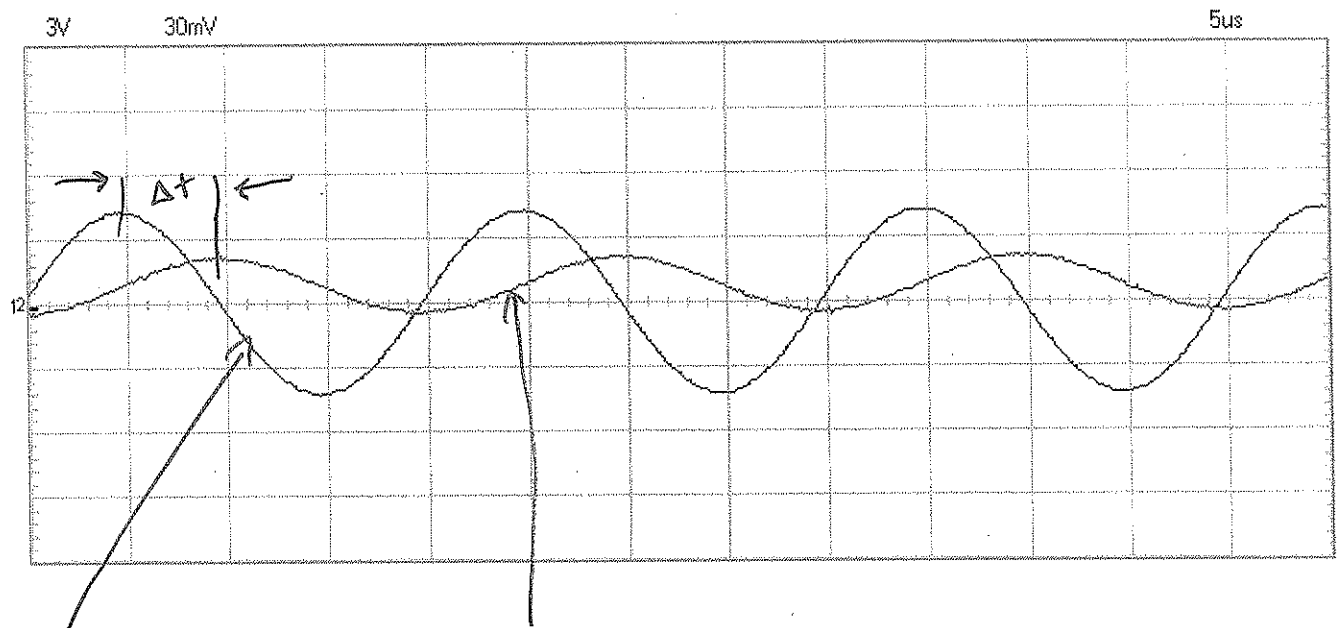
10 mH inductor has  $\approx 20 \Omega$  coil resistance

To Be Performed Before an OpEL GTA:

1. Insert the 10 mH inductor as the device under test and the shunt resistor.
  2. Explain the choice of the shunt resistor. – 20%  $R_i$  should be small w.r.t.  $Z_{\text{inductor}}$   
 $R_i$  should be large enough for measurable voltage at expected current
  3. Measure the voltage across the inductor – 10%.
  3. Demonstrate how to measure the current through the inductor – 20% – measure  $V_{R_i}$ ,  $I_{\text{inductor}} = \frac{V_{R_i}}{R_i}$
  4. Demonstrate the process to determine the phase angle between the applied voltage and the inductor current using the cursors on the oscilloscope voltage vs. time display – 20%.
- 1) measure  $V_i$  and  $V_{R_i}$
- 2) calculate period  $T$  of waveform ( $f = 20 \mu s$ )
- 3) measure  $\Delta t$  between  $V_i$  and  $V_{R_i}$ .
- 4)  $\theta = \frac{\Delta t}{T} \times 360^\circ$  (positive for inductor)
- angle will not be ideal  $-90^\circ$  due to series  $R_i$  and winding resistance



## Typical scope trace.



Blue line is V1 source. Red line is  $V_{R1}$  shunt.

Period  $T = 20\mu s$  (from cursors, waveform parameters, or calculated  $T = 1/f$ )

$V_{R1pp} \approx 28mV_{pp} = 14mV_p$  (from cursors or waveform parameters)

$I_L = I_{R1} = 14mA / 10\Omega = 1.4mA_p$   $R_1 = 10\Omega$

Red line lags blue line,  $\Delta t \approx -4.95\mu s$  (from cursors)

$\Theta = 360^\circ \times \Delta t / T \approx 89^\circ$