ECE 2100 Circuit Analysis
Spring 2016
Exam #2

NAME: _____

INSTRUCTIONS:

1. **THIS EXAM IS CLOSED BOOK AND CLOSED NOTES**. A "Potentially Useful Facts" sheet is provided.
2. **NO ELECTRONIC DEVICES ARE ALLOWED**.
3. Work each problem in the provided space.
4. Show ALL work required to arrive at a solution for either full or partial credit.
5. READ the entire question before answering.
6. CIRCLE YOUR ANSWERS.
7. Have your student ID on your desktop for inspection by the instructor.
8. SIGN the honesty pledge at the bottom of the page. Exams without a signature will receive no credit.

I have neither given nor received assistance from anyone in regards to completion of this exam. I have followed the instructions as provided on this sheet.

SIGNATURE: _____ DATE: _____

Note: some problems might be adapted from the course text or other sources. Schematics prepared using LTspice IV (linear.com).

Potentially Useful Facts

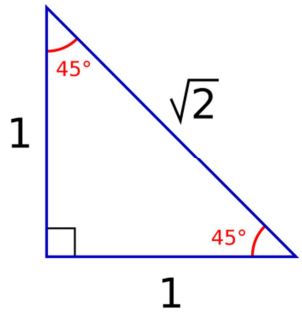
1. $A\angle\theta = Ae^{j\theta} = A\cos\theta + A\sin\theta\, j$

2. $\overrightarrow{\boldsymbol{Z_L}} = j\omega L$

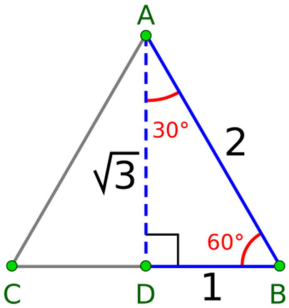
3. $\overrightarrow{\boldsymbol{Z_C}} = \dfrac{1}{j\omega C}$

4. $\vec{\boldsymbol{S}} = \overrightarrow{\boldsymbol{V_{RMS}}}\left(\overrightarrow{\boldsymbol{I_{RMS}}}\right)^*$ (follows passive sign convention)

5. $V_{\text{RMS}} = \sqrt{\dfrac{1}{T}\int_0^T v^2(t)dt}$

6. 

source (released to public domain):
https://commons.wikimedia.org/wiki/File:45-45-triangle.svg

7. 

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https://commons.wikimedia.org/wiki/File:30-60-90.svg

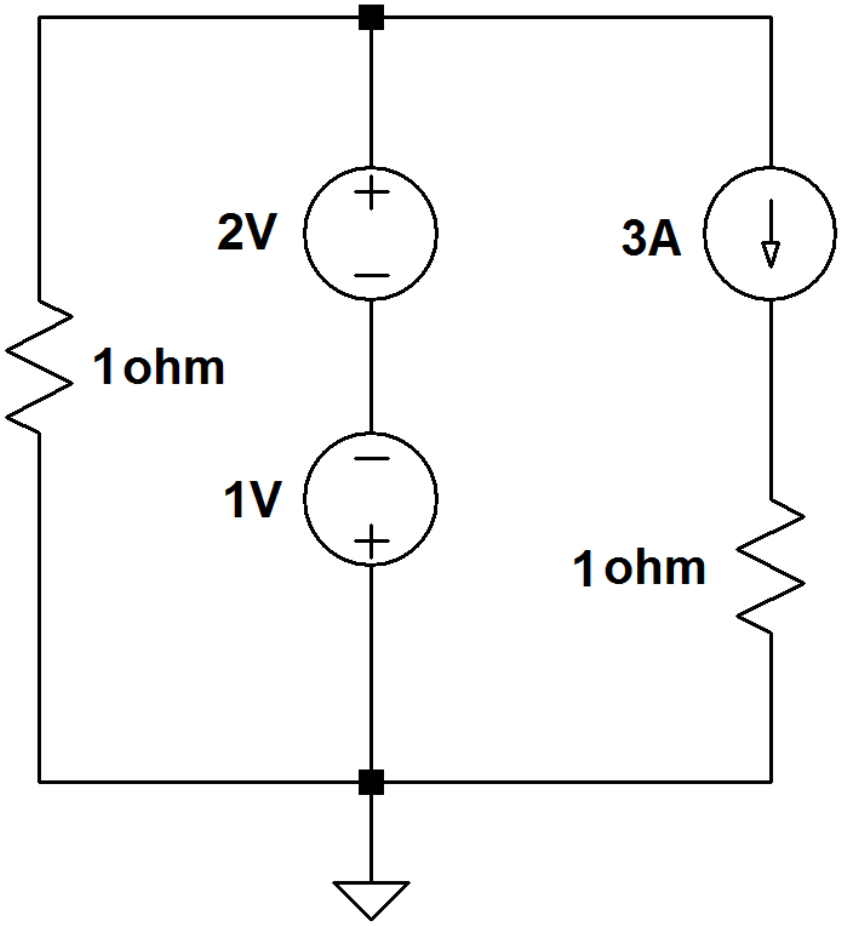
Maximum exam score is 30 points.

1. (2 points) Would an **ideal** inductor get warm if it was conducting a large current? Explain.

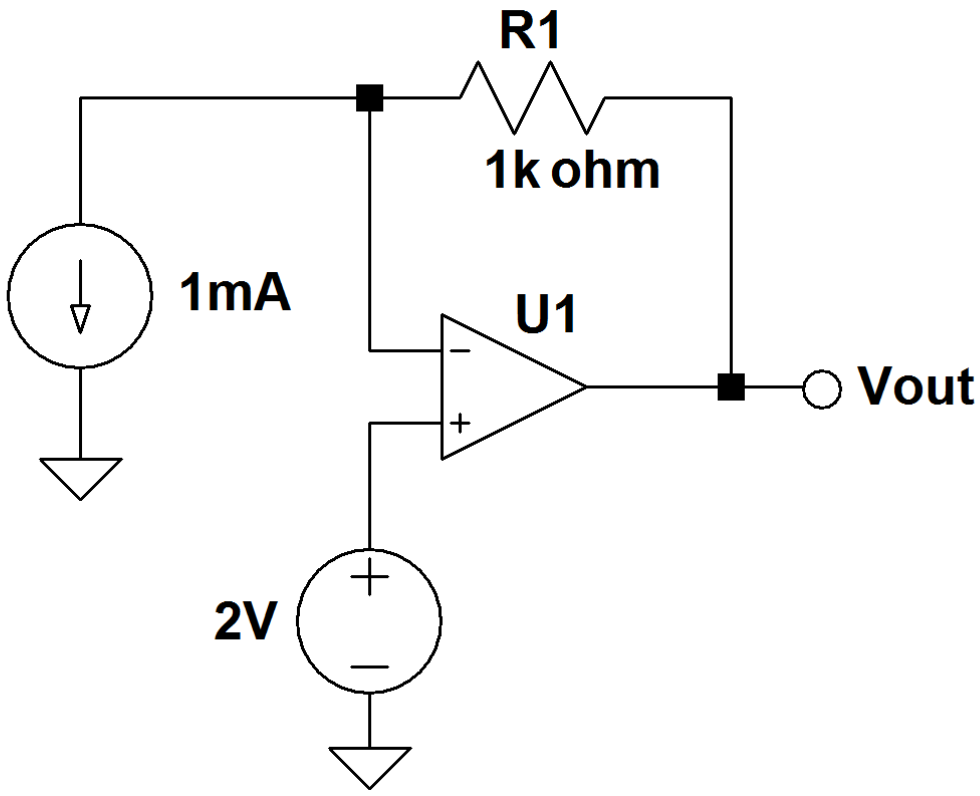
2. (2 points) Show how to build an impedance **1-j** ohms at 60 Hz.

3. (1 point) What is the primary benefit of using power factor correction in terms of electric power distribution?

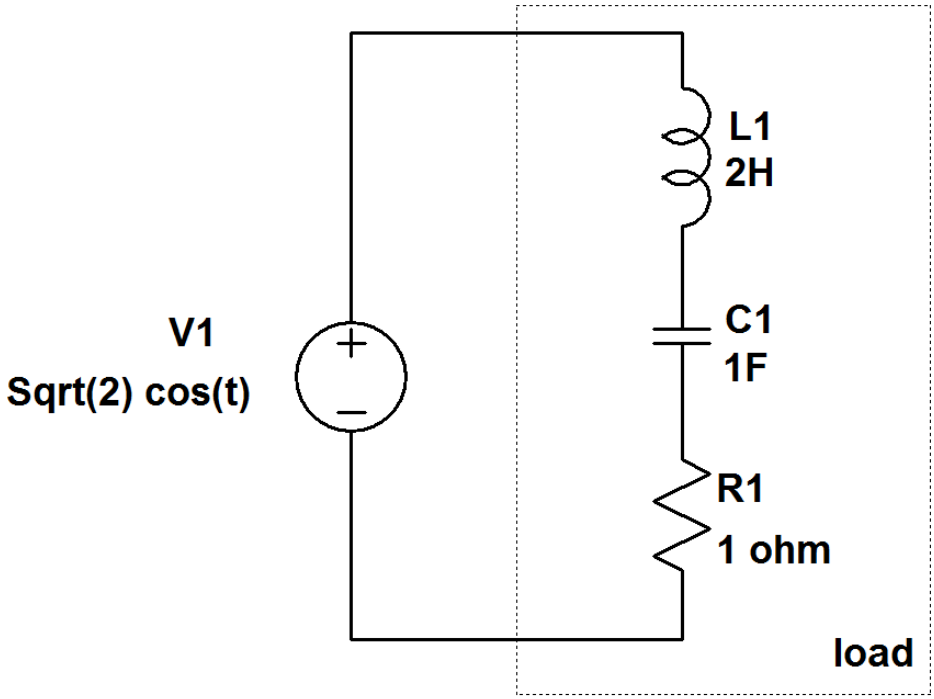
4. (5 points) Find the power of each circuit element.



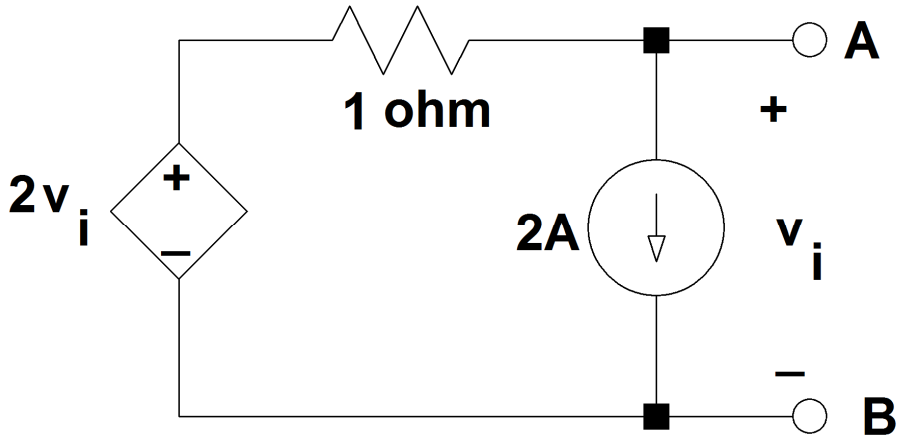
5. (5 points) Assuming an ideal operational amplifier:
    a. Find *Vout*.
    b. Find the power of the 1mA current source.



6. (5 points) Consider the following circuit. Find the complex power of the load (consisting of *L1*, *C1*, and *R1)*.



7. (5 points) Thevenize the following circuit “looking into” terminals A-B.



8. (5 points) Find current *i(t)* using phasor analysis and the superposition principle.