Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (please print)

Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ECE 2300 -- Exam #2

November 20, 2010

Keep this exam closed until you are told to begin.

1. This exam is closed book, closed notes. You may use one 8.5” x 11” crib sheet, or its equivalent.

2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution that is not given in a reasonable order will lose credit. Clearly indicate your answer (for example by enclosing it in a box).

3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**

4. Show all units in solutions, intermediate results, and figures. Units in the exam will be included between square brackets.

5. Do not use red ink. Do not use red pencil.

6. You will have 90 minutes to work on this exam.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/25

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/25

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/45

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_/25

Total = 120

Room for extra work

1. {25 Points} For the given circuit, use the Mesh-Current Method to write a complete set of independent equations that could be used to solve this circuit. Do not simplify the circuit. Do not attempt to solve or simplify your equations. Define all variables.



# Room for extra work

2. {25 Points} Use the circuit shown to solve this problem.

a) Find the value of the current *iO*.

b) If a resistor *RX* is connected between points 1 and 2 on this circuit, find the resistance of *RX* so that the maximum power is absorbed by this resistor.



Room for extra work

3. {45 Points} For the circuit shown, it is known that at the time just before the switch closed at *t* = 0, we had

*iA*(0-) = 5.3[mA], and

*iB*(0-) = -7.9[mA].

a) Find *iX*(0+).

b) Find *vE*(1[s]).

c) Find *iA*(). (This is a bonus question, worth 10{Points}).



Room for extra work

4. {25 Points} The circuit below is operating in steady-state.

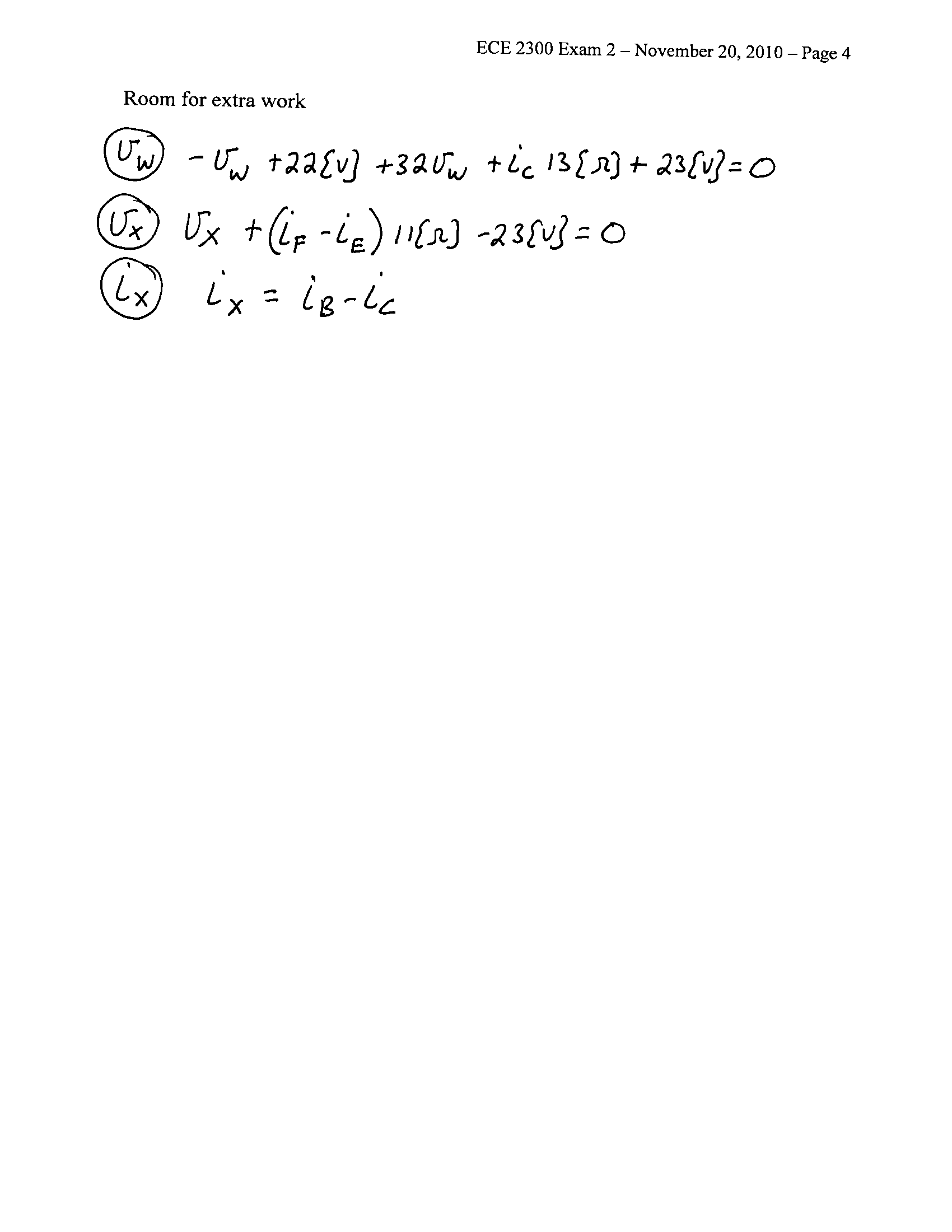
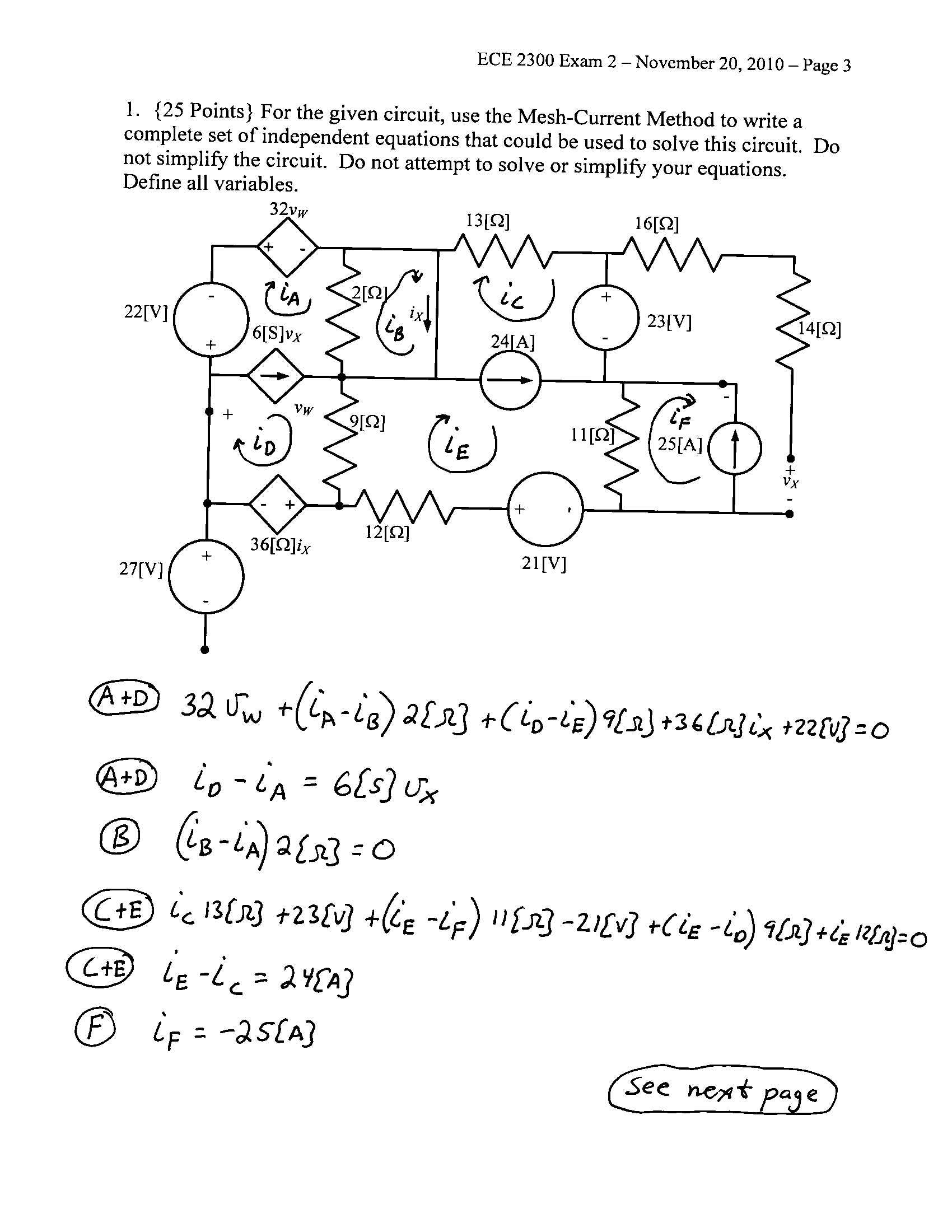
a) Find the frequency ** for which the current *iX* and the voltage *vS* are in phase.

b) Find the amplitude of *iX* at the frequency you found in part a).



Solutions:

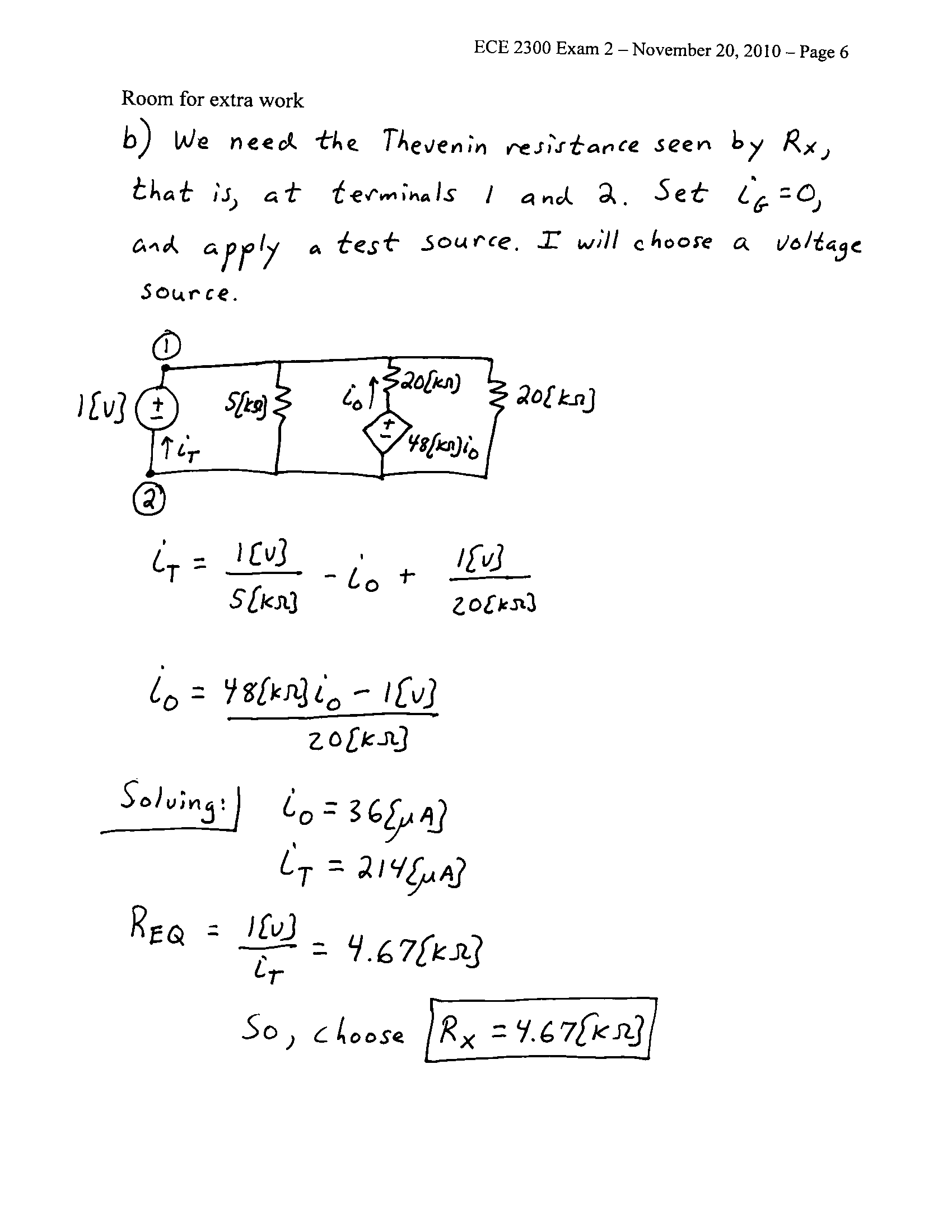
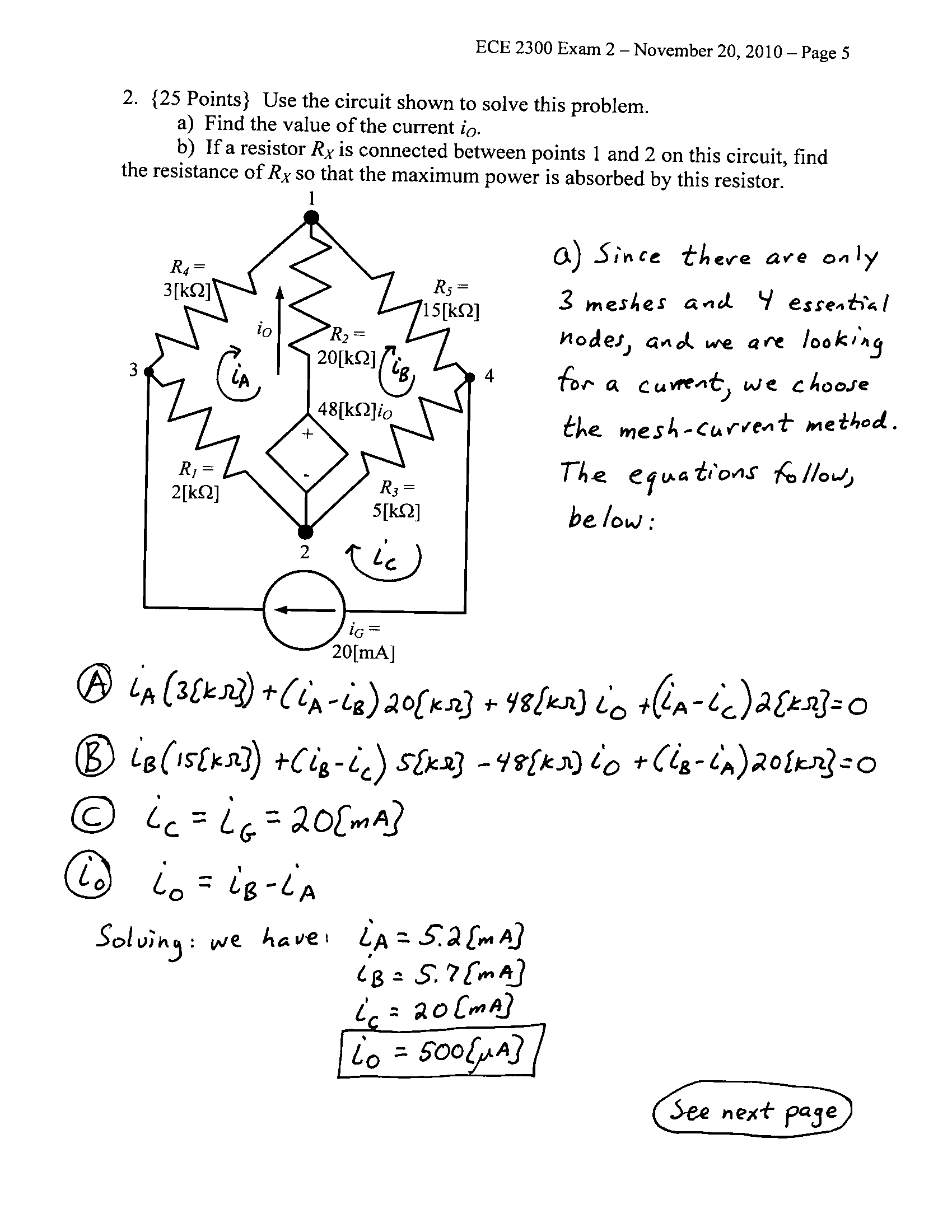
1. {25 Points} For the given circuit, use the Mesh-Current Method to write a complete set of independent equations that could be used to solve this circuit. Do not simplify the circuit. Do not attempt to solve or simplify your equations. Define all variables.



# 2. {25 Points} Use the circuit shown to solve this problem.

a) Find the value of the current *iO*.

b) If a resistor *RX* is connected between points 1 and 2 on this circuit, find the resistance of *RX* so that the maximum power is absorbed by this resistor.



3. {45 Points} For the circuit shown, it is known that at the time just before the switch closed at *t* = 0, we had

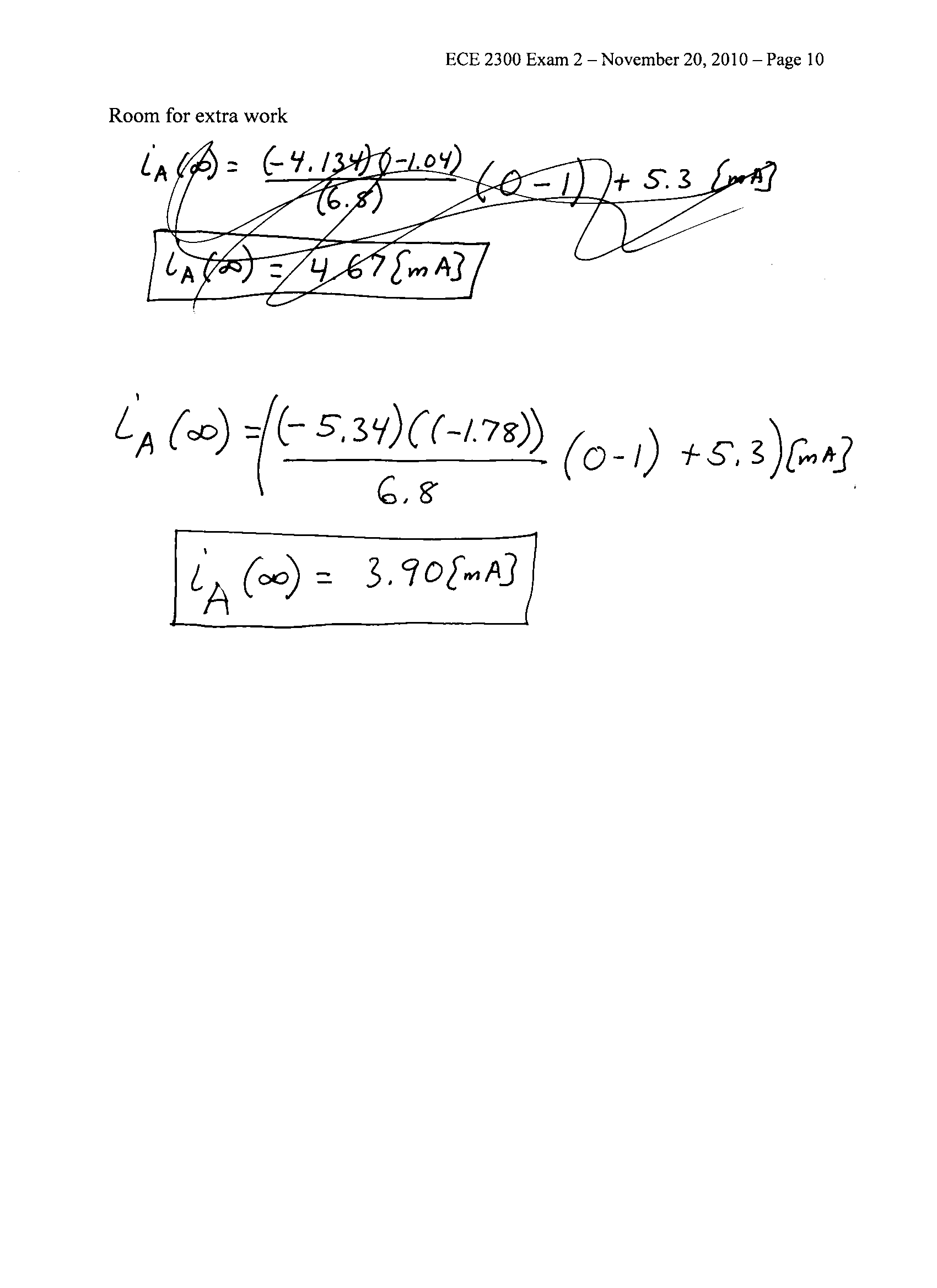
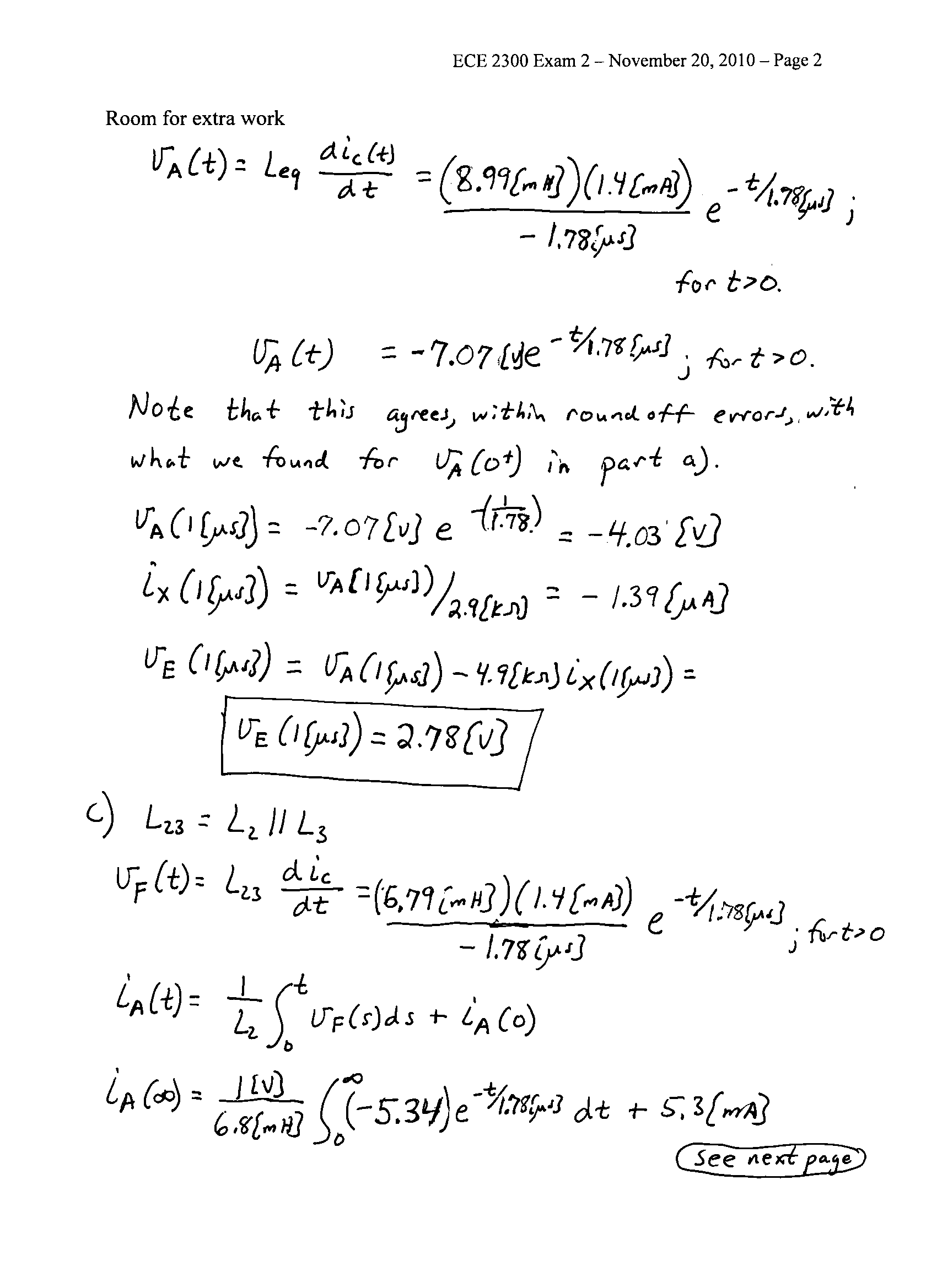
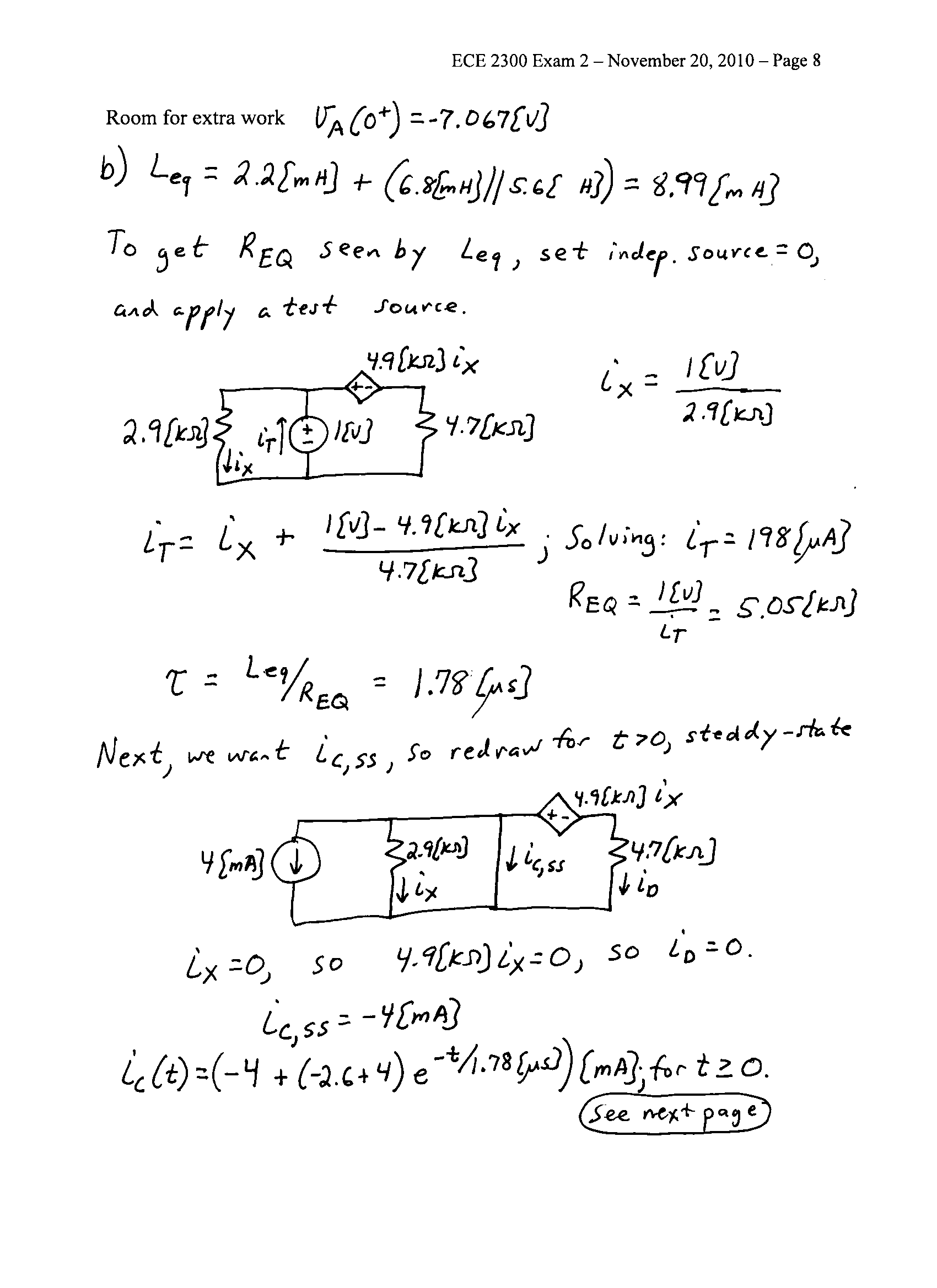
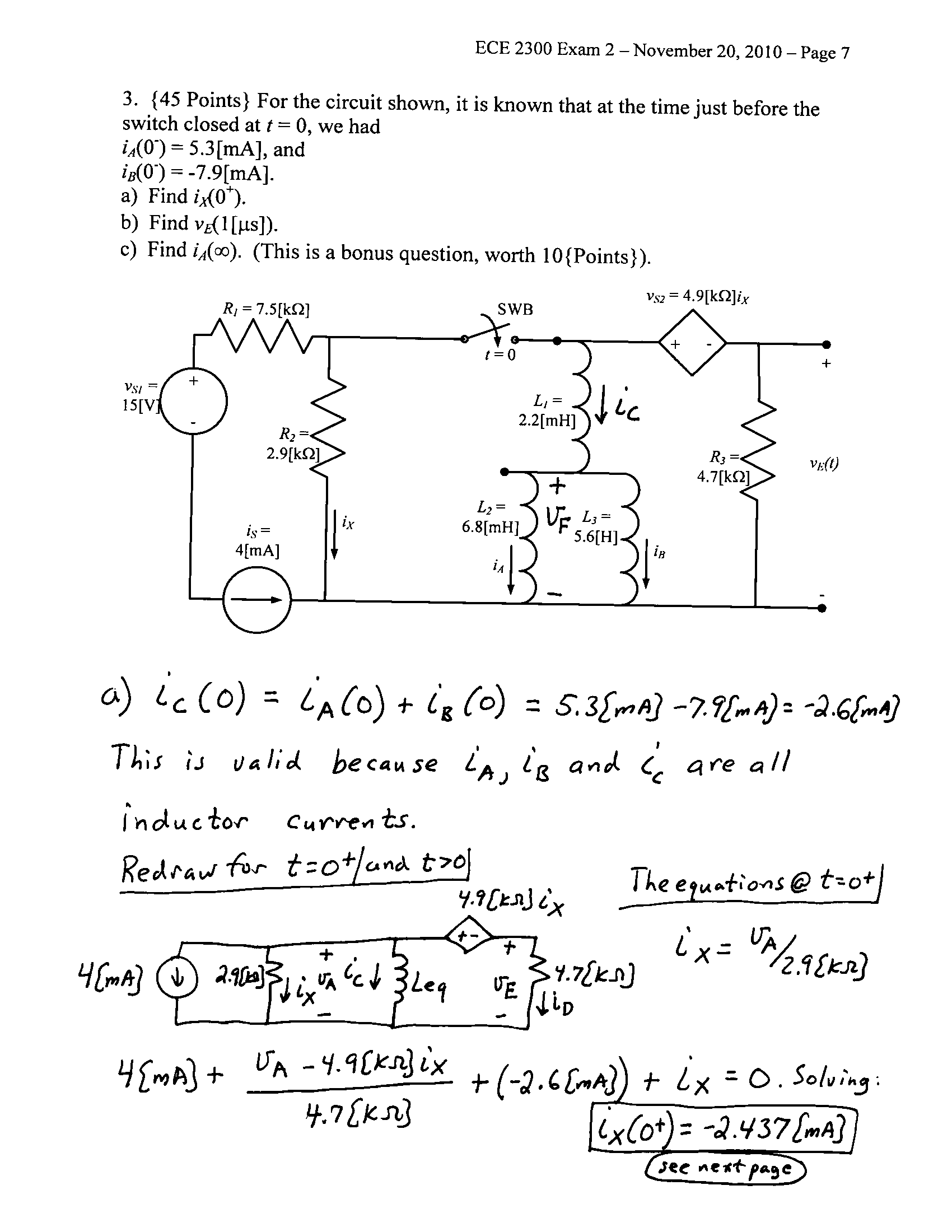
*iA*(0-) = 5.3[mA], and

*iB*(0-) = -7.9[mA].

a) Find *iX*(0+).

b) Find *vE*(1[s]).

c) Find *iA*(). (This is a bonus question, worth 10{Points}).



4. {25 Points} The circuit below is operating in steady-state.

a) Find the frequency ** for which the current *iX* and the voltage *vS* are in phase.

b) Find the amplitude of *iX* at the frequency you found in part a).



