Midterm 2

NAME:

SSID:

Instructions

Read all of the instructions and all of the questions before beginning the exam.

There are 4 problems in this exam. The total score is 100 points. Points are given next to each problem to help you allocate time. Do not spend all your time on one problem.

Unless otherwise noted on a particular problem, you must show your work in the space provided, on the back of the exam pages or in the extra pages provided at the back of the exam. Simply providing answers will only result in partial credit, even if the answers are correct.

Draw a BOX or a CIRCLE around your answers to each problem if one is not provided. Be sure to provide units where necessary.
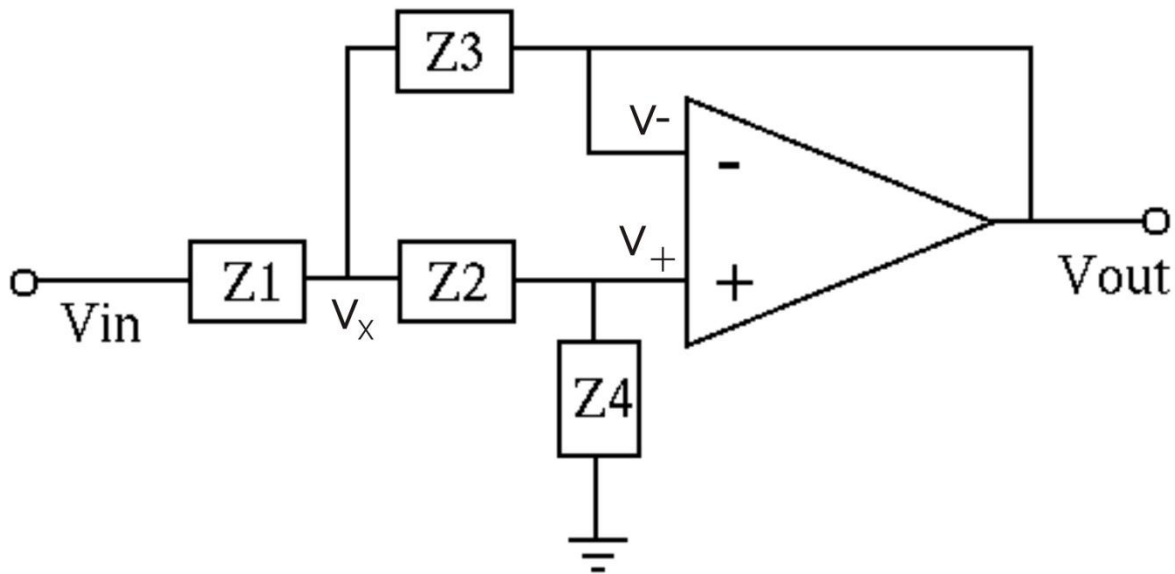
GOOD LUCK!

PROBLEM	POINTS	MAX
1		15
2		20
3		40
4		25

Problem 1 *Quickies* (10 points)
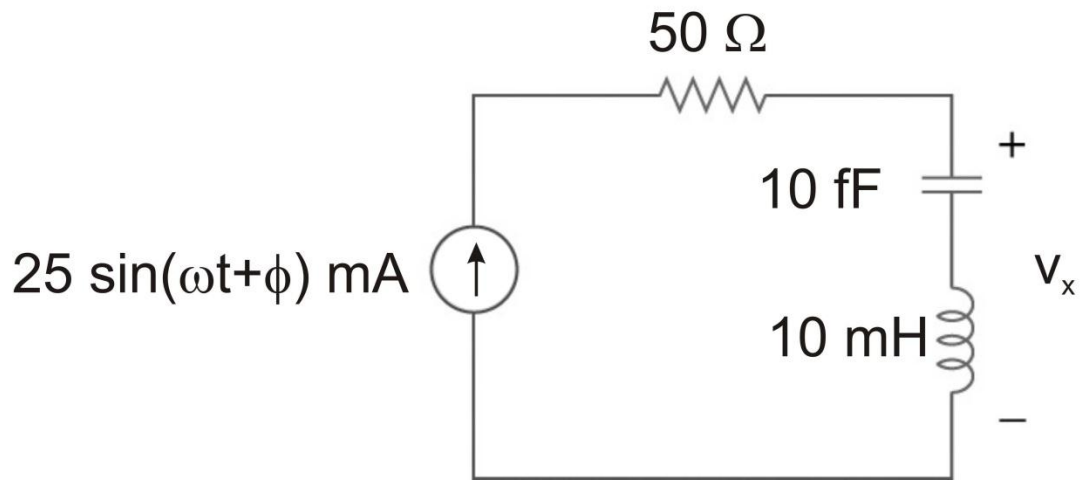
a) Consider the circuit below.

Using the symbols provided in the circuit, provide the missing components (in the grey boxes) of the two expressions below.

$$\frac{v_{in} - v_x}{Z_1} = \frac{v_x - v_{out}}{Z_3} + \boxed{}$$

$$v_x = v_{out} \left(\boxed{} \right).$$

(b) Find ω such that $v_x = 0$ for this circuit at t = ∞.   *(5 points)*

$$50 \; \Omega$$

25 sin(ωt+φ) mA   10 fF

$$v_x$$

10 mH

Problem 2 *First order circuits* *(20 points)*

Consider the circuit below. Note that V_S is a DC source. The switch opens at t = 0.
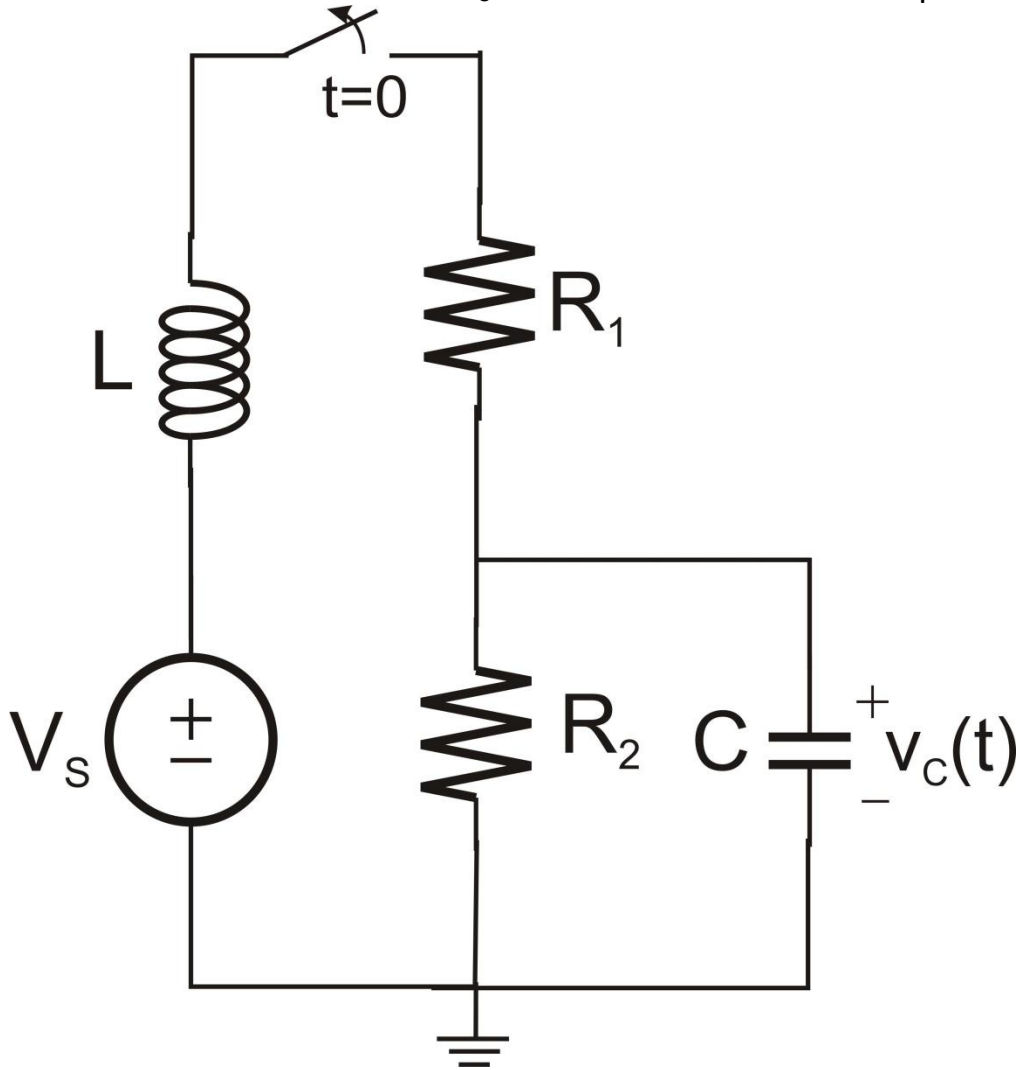
a) What is the value of V_c at t = 0^+?   **Write It in the BOX BELOW.**   *(5 points)*

b) Using whatever method you like, provide a ***symbolic expression*** for the voltage V$_C$(t) for t > 0 in the **BOX BELOW.** *(15 points)*
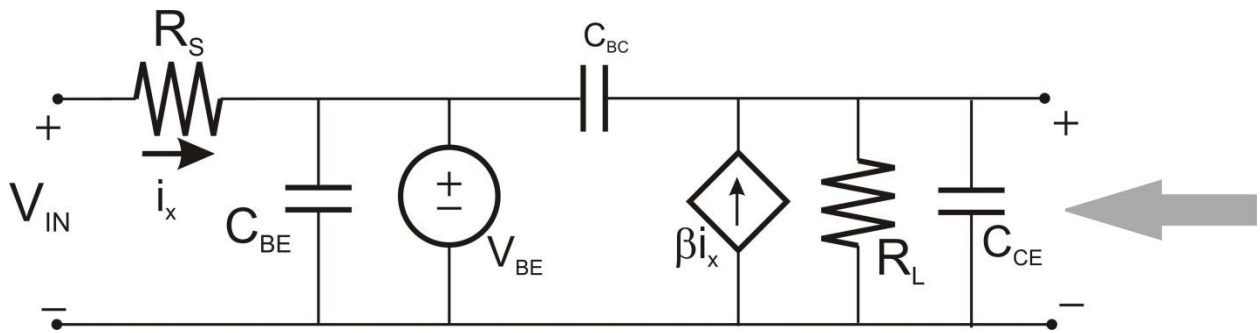
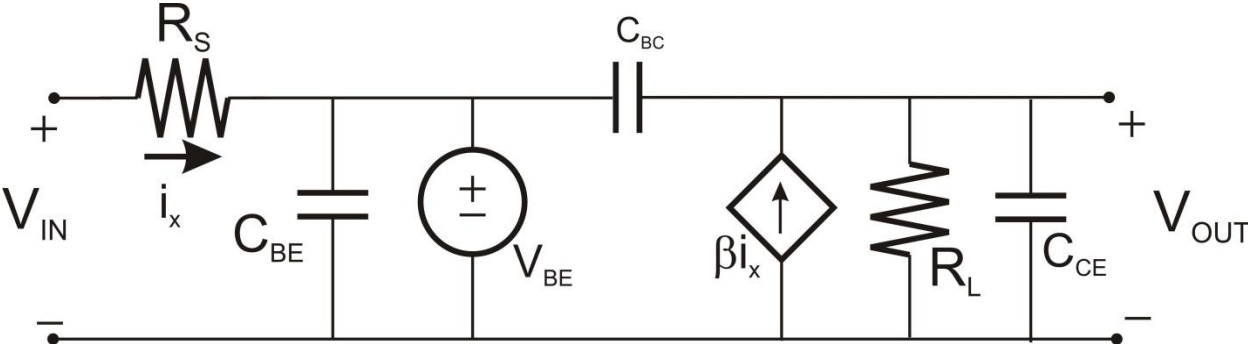**Problem 3** *Phasors*   *(35 points)*

a) Provide an equivalent circuit for the circuit below when looking in at the terminals indicated by the grey arrow. *(15 points)*
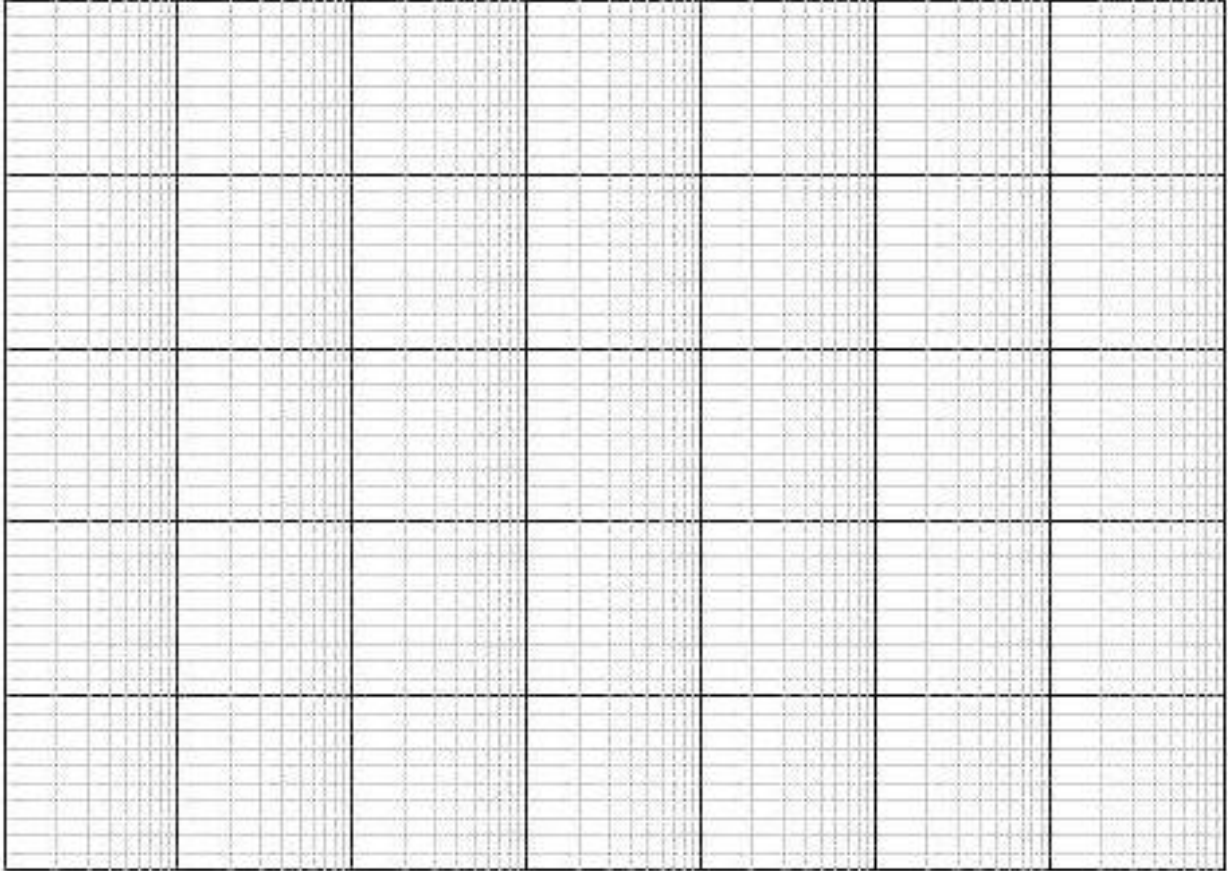
b) Provide an expression for the transfer function, $H(j\omega) = V_{OUT}/V_{IN}$, for the circuit below. *(10 points)*

c) For $R_S = R_L = 1 \text{ k}\Omega$, $C_{BE} = C_{CE} = 20 \text{ pF}$, $C_{BC} = 1 \text{ fF}$ and $\beta = 200$, provide a Bode plot of the magnitude of the transfer function above. *(15 points)*
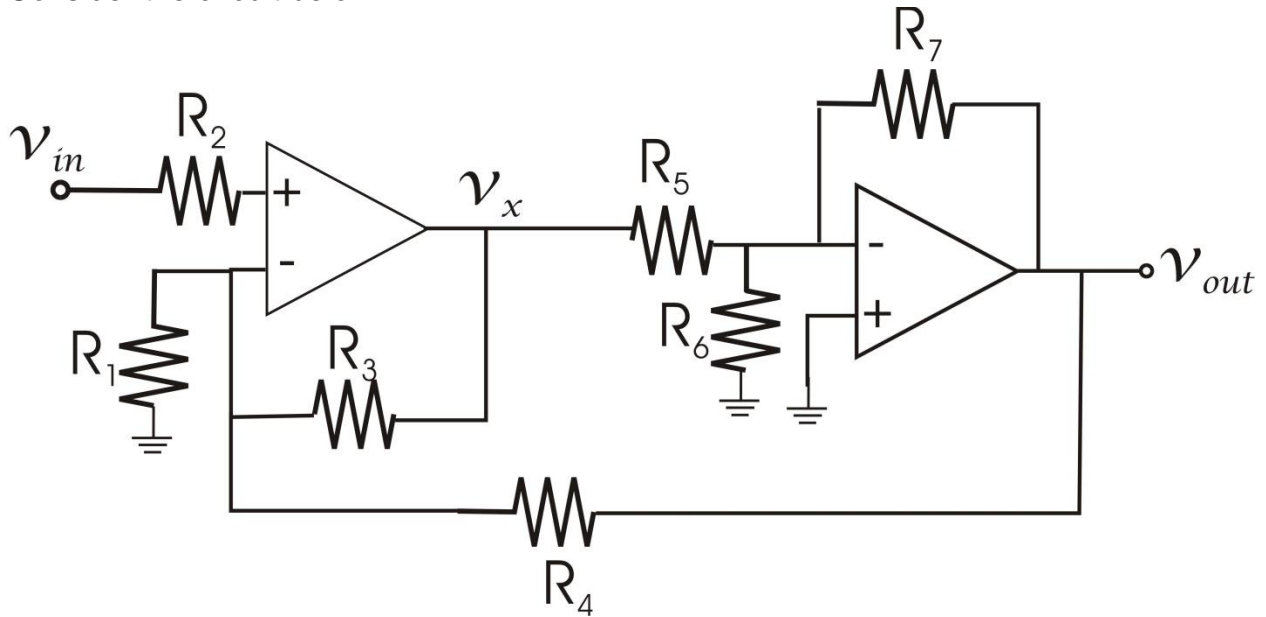
PROVIDE CLEAR AXIS LABELS!!!!

"Look, it's been swell, but the swelling's gone down"
-Tank Girl

Problem 4   *(25 points)*

Consider the circuit below.

a) Provide a SYMBOLIC expression for $\dfrac{v_{out}}{v_x}$ *(12.5 points)*

b) Provide a SYMBOLIC expression for $\dfrac{v_{out}}{v_{in}}$ (12.5 points)

Page for extra work