

Department of Electrical Engineering
New Mexico Institute of Mining and Technology

EE 101: Introduction to Electrical Engineering

Exam 2

Fall 2013

Oct. 29th, 2013

Name: _____

Instructor: Aly El-Osery

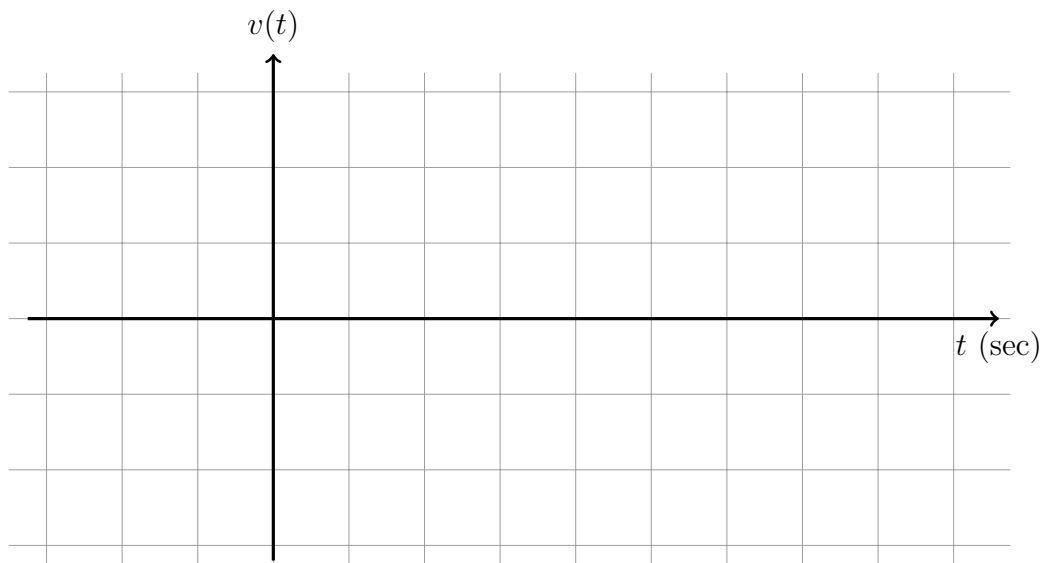
No calculators. No calculators.

Answer all questions in the space provided on the question sheets.
When applicable justify your answers. The problem solving process is more
important than the answer. Partial credit can be earned.

Make sure you list all the units

You must show all your work to get full credit.

1. (10 points) Using the figure below

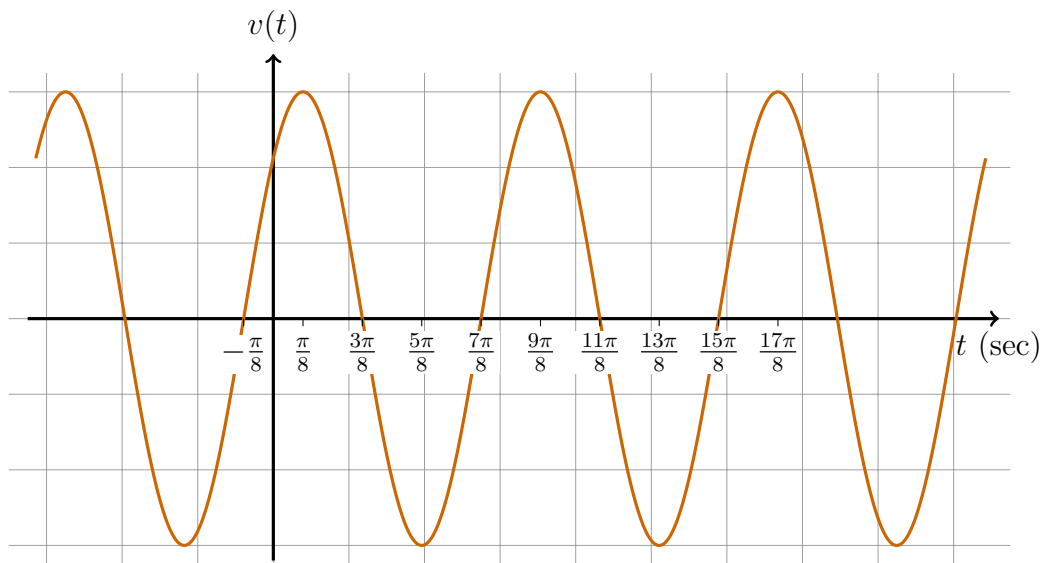


- (a) Sketch the following sinusoidal signal and label key values on the horizontal and vertical axis.

$$v(t) = 2 \cos\left(2\pi t - \frac{\pi}{2}\right)$$

- (b) Clearly label T , V_p , t_{max} , and V_{pp} on your plot and indicate what the units are.

2. (20 points) Given the figure below



Determine the following and **indicate what the units are**

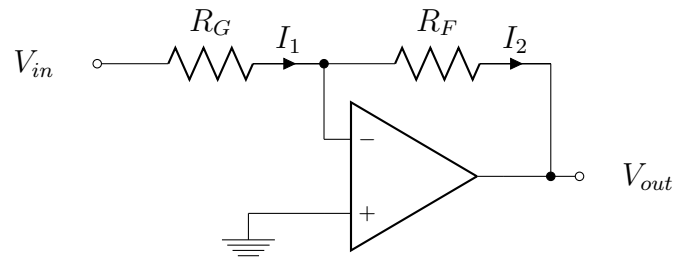
(a) Period T

(b) Frequency F

(c) Angular frequency ω

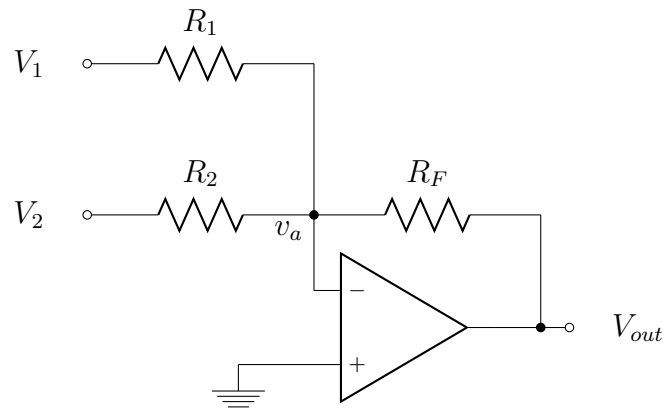
(d) Phase angle θ

3. (15 points) Using the basic circuit below.



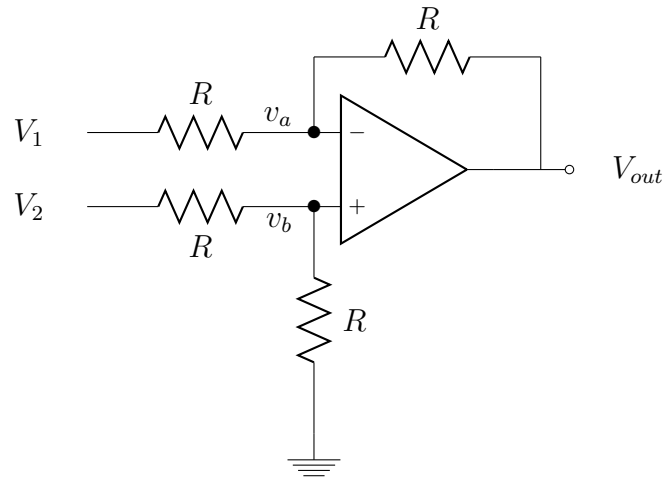
- (a) Compute the current through R_G .
- (b) Compute the output voltage, V_{out} , as a function of V_{in} , R_G , and R_F .
- (c) Design an amplifying circuit with a gain of $1/10$. Make sure that the output is the **same polarity** as the input. Sketch your circuit, indicate all the values of each component, label the terminals of the op-amp(s) and show all your work. (Note. You may need more than one circuit).

4. (15 points) Given the circuit below



- (a) What is the voltage v_a ?
- (b) Compute the current through
1. R_1
 2. R_2
- (c) Write an expression for V_{out} in terms of V_1 and V_2 . **Show all your work and label important information on the circuit.**
- (d) What function is this circuit performing.?

5. (5 points) (**extra credit**) Given the circuit below



- (a) Write an expression for V_{out} in terms of V_1 and V_2 . **Show all your work and label important information on the circuit.**

- (b) What function is this circuit performing.?