

Physics 181, Spring 2016

Name: _____

Exam 1

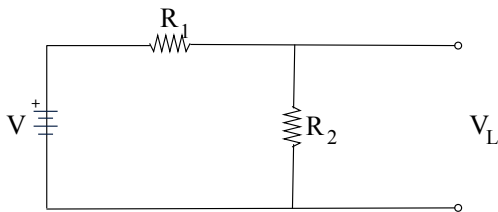
Show all work! No credit will be given for answers without supporting work. Work as neatly as possible in the space provided. The point values for each problem are shown so that you can time yourself accordingly. The entire exam is worth 70 points. **Good luck!**

1. (5 points) A $3\text{k}\Omega$ is hooked up to a 12 V battery. What current does the resistor draw from the battery?
2. (5 points) A $4\mu\text{F}$ capacitor is hooked up in series with a $12\mu\text{F}$ capacitor. What is the equivalent capacitance?
3. (5 points) What is the impedance of a $4\mu\text{F}$ capacitor at a frequency of 15 kHz.
4. (5 points) What is $e^{j\pi}$? Show why.

5. (10 points) Write $v = 3 + j4$ in the form $V_0 e^{j\theta}$

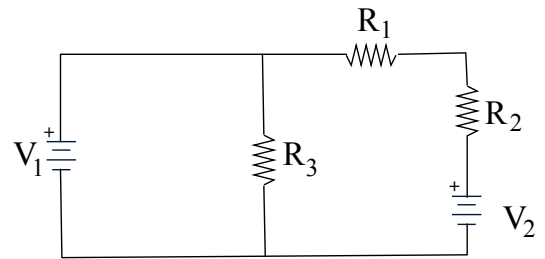
6. (5 points) Show that the voltage divider equation for this case is:

$$V_L = \frac{R_2}{R_1 + R_2} V$$



7. (20 pts) For the circuit shown below, $V_1 = 9\text{V}$, $V_2 = 12\text{V}$, $R_1 = 1\text{k}\Omega$, $R_2 = 2\text{k}\Omega$, $R_3 = 3\text{k}\Omega$

- (a) Find the current through each of V_1 , R_3 , and R_2 .
- (b) Find the power dissipated in R_2 .



8. (15 points) For the circuit shown here, $v_i = V_0 \cos \omega t$.

- Derive an expression for the gain in terms of ω , R and C . (You may leave it in the form $A + jB$.)
- Derive an expression for the phase shift between v_o and v_i

