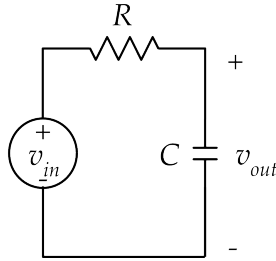


**Olin College of Engineering**  
**ENGR2410 – Signals and Systems**

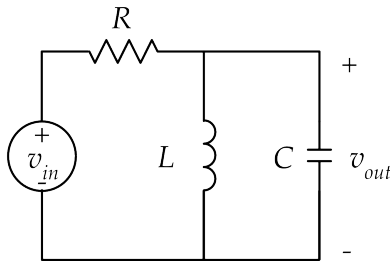
**Assignment 2**

**Problem 1:** (5 points) Consider the RC circuit shown below.



- A. Find  $v_{out}(t)$  when  $v_{in} = V \sin \omega t$ . Assume the system is in sinusoidal steady state (i.e., all transients have disappeared).
- B. Assume an input  $v_{in} = V \sin(\omega t)u(t)$  so that the circuit is initially at rest. Find an expression for  $v_{out}(t)$  when  $t > 0$ . *Hint: The solution for the previous part is needed here.*
- C. Plot the solution assuming  $V = 1$ ,  $\omega = 1$ , and  $RC = 1$  as well as  $V = 1$ ,  $\omega = 10$ , and  $RC = 1$ .

**Problem 2:** (5 points) Consider the RLC circuit shown below.



- A. Find a differential equation that relates  $v_{in}$  and  $v_{out}$ .
- B. Derive an expression for the transfer function from  $v_{in}$  to  $v_{out}$ .
- C. Sketch the Bode plot for the transfer function from  $v_{in}$  to  $v_{out}$  using asymptotic approximations.