HOMEWORK #6

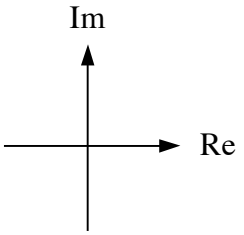
1. a) Find $\mathcal{L}\left\{\int_0^t e^{-6\tau}u(6\tau)d\tau\right\}$.

   b) Find $f(t)$ if $F(s)=\dfrac{6s+27}{s^2+4s+29}$.

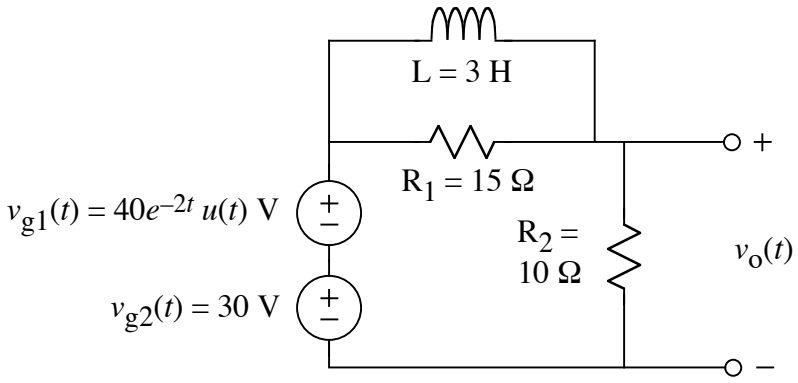
   c) Find $\lim_{t\to\infty} f(t)$ if $F(s)=\dfrac{3}{s[(s+4)^2+36]}$.

   d) Plot the poles and zeros of F(s) in the s plane.

$$F(s)=\frac{s^2+8s+16}{(s+8)(s^2+6s+34)}$$



2.



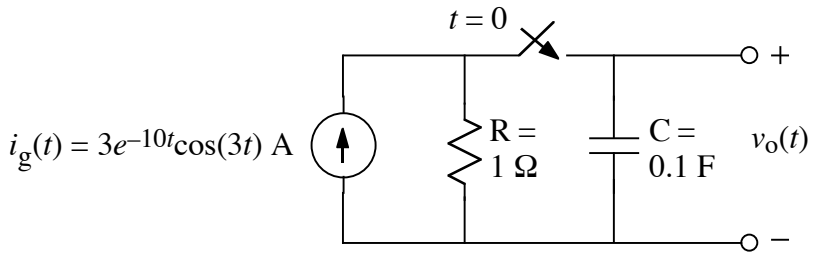
   a) Write the Laplace transform, $V_{g1}(s)$, of $v_{g1}(t)$.

   b) Draw the s-domain equivalent circuit, including sources $V_{g1}(s)$ and $V_{g2}(s)$, components, initial conditions for L, and terminals for $V_o(s)$. Note that the 30 V source is on for all time.

   c) Write an expression for $V_o(s)$. You may write parallel impedances using the || operator without having to simplify them.

   d) Apply the initial value theorem to find $\lim_{t\to 0^+} v_o(t)$.

3. Find the inverse Laplace transform for each of the following expressions:



Note: The initial voltage on the capacitor is $v_C(t = 0^-) = 3$ V.

a) Write the Laplace transform $I_g(s)$ of $i_g(t)$.

b) Write the Laplace transform $V_o(s)$ of $v_o(t)$. Be sure to include the effects of the initial voltage on the C.

c) Write a numerical time-domain expression for $v_o(t)$ where $t > 0$. Hint: plug in numbers and look for terms that cancel before computing partial fractions.