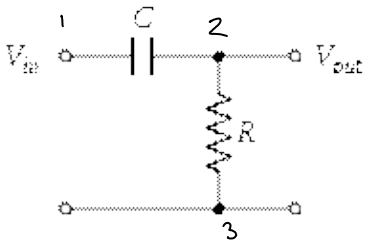
HW3

12 October 2013
13:13



We know that
$V_C = \frac{Q}{C}$ for capacitors,
$V_R = IR$ for resistors,
and Kirchoff's current law says $I_{12} + I_{23} = 0$, given an open circuit as ↑

$V_{out} - V_{in} = \int I_{12}/C$ and $V_{out} - V_{in} = I_{23}R$

$\frac{d}{dt}(V_{out} - V_{in}) \cdot C = I_{12}$ $\qquad I_{23} = \frac{-1}{R}(V_{out} - V_{in})$

$C(\dot{V}_{out} - \dot{V}_{in}) - \frac{1}{R}(V_{out} - V_{in}) = 0$

$\dot{V}_{out} - \dot{V}_{in} - \frac{1}{RC}(V_{out} - V_{in}) = 0$

$V_{out} = V_0 e^{i\frac{1}{RC}t}$