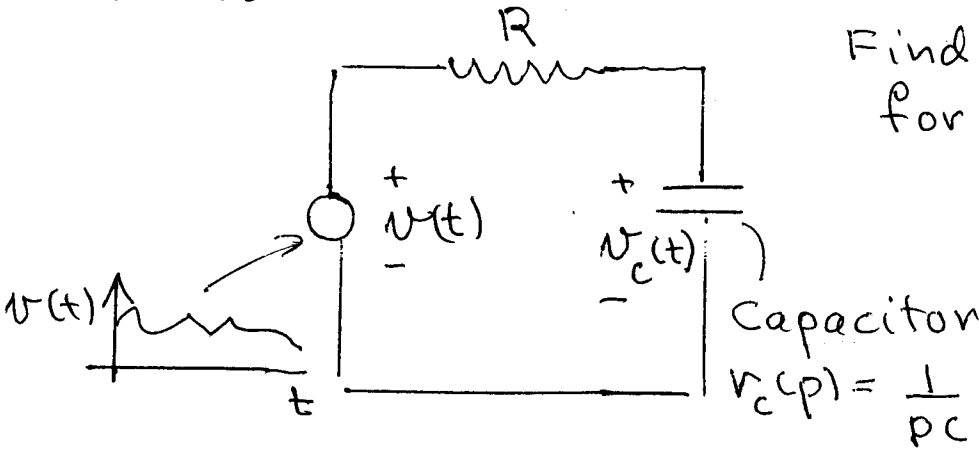


Simple Derivation using  $p = \frac{d}{dt}$  "operator" when we have storage elements (L and C) Consider



Find the DE for  $v_c(t)$

Use the voltage divider relation

$$v_c(t) = \frac{v_c(p)}{v_c(p) + R} v(t)$$

$$= \frac{\frac{1}{pc}}{\frac{1}{pc} + R} v(t)$$

Now clear the  $p$ 's

a) multiply through by  $pc$  on the R.H.S.

$$v_c(t) = \frac{1}{1 + pCR} v(t)$$

b) multiply both sides by  $(1 + pCR)$

$$(1 + pCR)v_c(t) = v(t)$$

c) let  $p = \frac{d}{dt}$  so the final DE

$$v_c(t) + CR \frac{dv_c}{dt} = v(t)$$

One of the LT spice pictures shows the solution when  $v(t)$  is a rectangular pulse