Energy in a switched R-C circuit

Figure 1 shows a series switch-R-C circuit. The ideal switch is closed at time $t = 0$ and remains closed for $t > 0$. For $t < 0$, the voltage on the capacitor, $v_c$, is zero.

![Switched R-C circuit](image)

Figure 1: Switched R-C circuit

(a) Solve for a symbolic expression for the time-domain signals $v_c(t)$, $v_R(t)$, and $i_c(t)$ as functions of the variables, $R$, $C$, and $V_{DC}$

(b) Solve for the total energy stored in the capacitor, the total energy lost in the resistor, and the total energy supplied by the voltage source from $t = 0$ to $t = \infty$

(c) The resistance $R$ is shorted. Under the same conditions, solve for the total energy stored in the capacitor and the total energy supplied by the voltage source from $t = 0$ to $t = \infty$