The switch closes at $t = 0$ after being open for a long time.

Determine $v_x$ for all $t \geq 0$. 
Box A contains only sources and resistors. The open-circuit voltage is 12 V, and the short-circuit current is 40 mA.

Box B contains resistor $R$ and (uncharged) capacitor $C$ connected as shown.

The boxes are connected at $t = 0$. Subsequently,

$$v(t) = 8 \left(1 - e^{-t/\tau}\right),$$

where $\tau = 1$ ms. Find values for $R$ and $C$. 

![Circuit Diagram](image)
Determine the Laplace transform $X(s)$ for each of the following:

a) 

$$x(t) = 4 e^{-2t} \cos 3t \ u(t - 1)$$

b) 

[Diagram of a triangle function]
Determine the inverse Laplace transform \( x(t) \) for each of the following:

a)

\[
X(s) = \frac{s^2 + 7s + 12}{(s + 2)(s^2 + 6s + 5)}
\]

b)

\[
X(s) = \frac{3s + 1}{s^2 + 2s + 5}
\]
Find the $s$-dependent equivalent impedance for the circuit drawn below and identify the characteristic poles and zeros.

These are the $s$ values that make $Z \to \infty$ and $Z = 0$, respectively.
A circuit has one zero at \( s = -1 \) and one pole at \( s = -2 \).

Synthesize a circuit with these characteristics.
Consider the cascaded system drawn below.

The following facts are known:

- \( v_x(t) = \delta(t) \)
- \( v_1(t) = 2e^{-t} u(t) \)
- \( v_3(t) = 3 [1 - 2e^{-t} + e^{-2t}] \)

Determine \( H_2(s) \).
Consider the cascaded system drawn below.

![Cascaded System Diagram]

The following facts are known:

- \( v_x(t) = u(t) \)
- \( v_2(t) = 3e^{-2t} - 2e^{-3t} \)
- \( H_2(s) = \frac{s + 5}{s + 3} \).

Determine \( v_1(t) \).
Determine the unit step response.
Determine the unit step response.