In the given circuit,
\[ v(t) = 50 \, e^{-240t} \, V, \quad t > 0 \]
\[ i(t) = 9 \, e^{-240t} \, mA, \quad t > 0 \]

Calculate the time constant \( \tau \).

The time constant \( \tau \) is \( \underline{\phantom{0000}} \) ms.

**Hints**

**Hint #1**

**References**

**Worksheet** Difficulty: Easy

Learning Objective: Understand solutions to unforced, first order linear differential equations.
2. **Award: 10.00 points**

Find the time constant for the RC circuit in the given figure. Assume \( R = 12 \, \Omega \).

The time constant for the RC circuit in the given figure is \( \boxed{\text{[s]}} \).

**Hints**

**Hint #1**

**References**

**Worksheet** Difficulty: Easy  
Learning Objective: Understand solutions to unforced, first order linear differential equations.

3. **Award: 10.00 points**

The switch in the given figure has been in position \( A \) for a long time. Assume the switch moves instantaneously from \( A \) to \( B \) at \( t = 0 \). Find \( v \) for \( t > 0 \). Assume \( R = 3 \, k\Omega \).

The voltage \( v(t) = v(0) \, e^{-t/\tau} \), where \( v(0) = \boxed{\text{[V]}} \) and \( \tau = \boxed{\text{[s]}} \).
In the given circuit, find the unknown quantities of \( i(t) \) for \( t > 0 \) if \( i(0) = 8 \) A. Assume \( L = 7 \) H.

The current \( i(t) = 8e^{-\frac{t}{\tau}} \) A, where \( \tau = \) s.

[Diagram of the circuit with components labeled]
In the given circuit, find the value of $R$ for which the steady-state energy stored in the inductor will be 1.6 J.

![Circuit Diagram]

The value of $R$ is $\Omega$.

6. **Award: 10.00 points**

Express $v(t)$ in the given figure in terms of step functions.

$v(t) = (5u(t - 1) + 10u(t) - 26u(t + 2) + 16u(t + 2))$ V
7. **Award: 10.00 points**

The voltage across a 10-mH inductor is $40 \delta(t - 2) \text{ mV}$. Find the inductor current, assuming that the inductor is initially uncharged.

The inductor current is $i(t) = \underline{u(t - 2)} \text{ A}$.

8. **Award: 10.00 points**

Find the solution of the differential equation $\frac{d^2 v}{dt^2} + 4v = 0, \quad v(0) = -1 \text{ V}$. 

---

**Hints**

**Hint #1**

**References**

**Multiple Choice** Difficulty: Medium

Learning Objective: Understand singularity equations and their importance in solving linear differential equations.
The solution of the given differential equation is \(- (e^{\boxed{\text{t}}} V).\)

9. **Award: 10.00 points**

Identify the solution of the following differential equation, subject to the stated initial condition.

\[
2 \frac{dv}{dt} - v = 3u(t), \quad v(0) = -6
\]

- \(v(t) = 3 \left(1 - e^{t/2}\right) u(t) V, \quad t > 0\)
- \(v(t) = -3 \left(1 + e^{t/2}\right) u(t) V, \quad t > 0\)
- \(v(t) = 3 \left(1 - e^{t/2}\right) V, \quad t < 0\)
- \(v(t) = -3 \left(1 + e^{t/2}\right) V, \quad t < 0\)
A circuit is described by

\[ 1 \frac{d^2}{dt^2} + \nu = 10. \]

**References**

**Section Break**

Difficulty: Medium

Learning Objective: Understand singularity equations and their importance in solving linear differential equations.

---

10. **Award: 10.00 points**

If \( \nu(0) = 4 \), find \( \nu(t) \) for \( t \geq 0 \).

The voltage \( \nu(t) = \text{[Blank]} + \text{[Blank]} (e^{-t}) \times u(0) \text{V.} \)

**Hints**

**Hint #1**

**Hint #2**

---

**References**

**Worksheet**

Difficulty: Medium

Learning Objective: Understand singularity equations and their importance in solving linear differential equations.