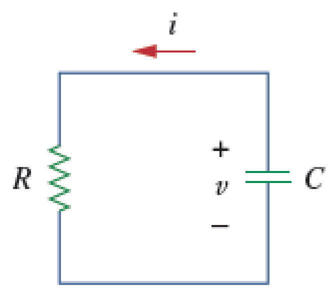
In the given circuit,
$v(t) = 58\,e^{-240t}\,\mathrm{V}$, $t > 0$

$i(t) = 9\,e^{-240\,t}\,\mathrm{mA}$, $t > 0$



References

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

1. Award: **10.00 points**

Calculate the time constant τ.

The time constant τ is ______ ms.

Hints

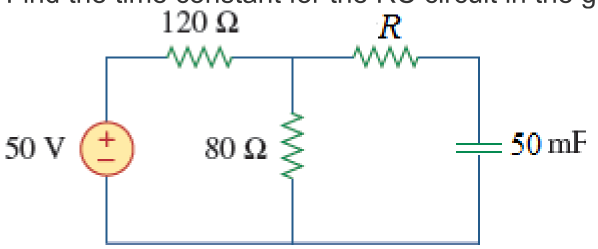
Hint #1

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 Ω.



The time constant for the RC circuit in the given figure is ______ s.

Hints

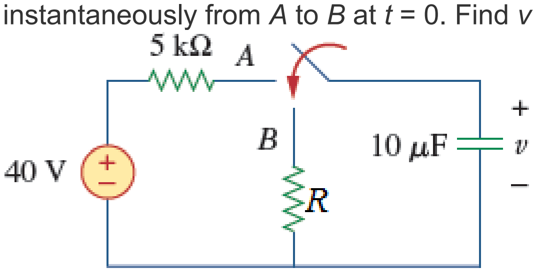
Hint #1

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 kΩ.



The voltage $v(t) = v(0)\ e^{-t/\tau}$, where $v(0)$ = ______ V and τ = ______ s.

Hints

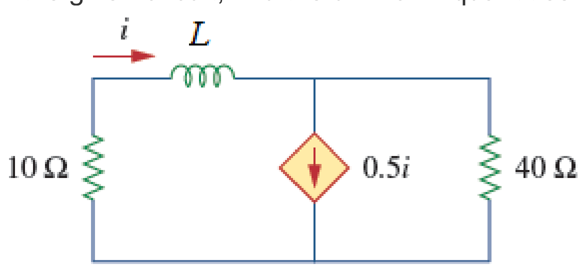
Hint #1

References

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

4. Award: **10.00 points**

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 $i(t) = 8e^{-t/\tau}$ A, where τ = ______ s.

Hints

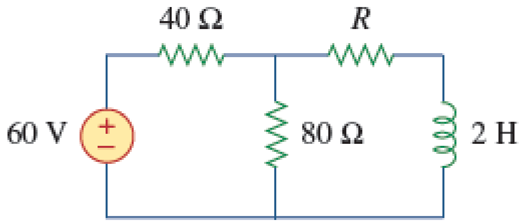
Hint #1

References

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

5. Award: **10.00 points**

In the given circuit, find the value of *R* for which the steady-state energy stored in the inductor will be 1.6 J.



The value of *R* is [ ] Ω.

Hints

Hint #1

Hint #2

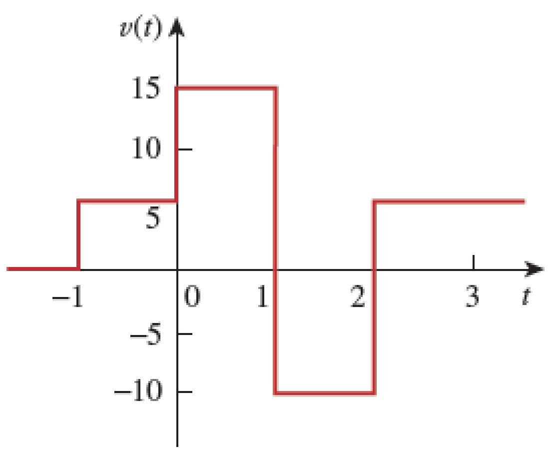
Hint #3

References

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

6. Award: **10.00 points**

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



○ $v(t) = (5u(t-1) + 10u(t) - 25u(t+2) + 15u(t+2))$ V

- ○ $v(t) = (5u(t+1) + 10(t-1) - 25u(t) + 15u(t-2))$ V
- ○ $v(t) = (5u(t-2) + 10u(t-1) - 25u(t) + 15u(t+1))$ V
- ○ $v(t) = (5u(t+1) + 10u(t) - 25u(t-1) + 15u(t-2))$ V

Hints

Hint #1

References

Multiple Choice Difficulty: Medium Learning Objective: Understand singularity equations and their importance in solving linear differential equations.

7. Award: **10.00 points**

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

The inductor current is *i*(*t*) = ______ $u(t-2)$ A.

Hints

Hint #1

References

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

8. Award: **10.00 points**

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

The solution of the given differential equation is – ($e^{-\square t}$) V.

Hints

Hint #1

References

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

9. Award: **10.00 points**

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

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

- $v(t) = 3\,(1 - e^{t/2})u(t)$ V, $t > 0$
- $v(t) = -3\,(1 + e^{t/2})u(t)$ V, $t > 0$
- $v(t) = 3\,(1 - e^{t/2})$ V, $t < 0$
- $v(t) = -3\,(1 + e^{t/2})$ V, $t < 0$

Hints

Hint #1

Hint #2

References

Multiple Choice Difficulty: Medium Learning Objective: Understand singularity equations and their importance in solving linear differential equations.

A circuit is described by

$1\frac{dv}{dt} + v = 10$.

References

Section Break	Difficulty: Medium	Learning Objective: Understand singularity equations and their importance in solving linear differential equations.

10. Award: **10.00 points**

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

The voltage $v(t)$ = [ ] + ([ ]) ($e^{-[\ ]t}$) $\times u(t)$ V.

Hints

Hint #1

Hint #2

References

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