

Exercise 31.13 - Enhanced - with Feedback

1 of 18

Review | Constants

You have a resistor of resistance 160Ω , an inductor of inductance 0.450 H , a capacitor of capacitance $5.70 \mu\text{F}$ and a voltage source that has a voltage amplitude of 27.0 V and an angular frequency of 270 rad/s . The resistor, inductor, capacitor, and voltage source are connected to form an $L-R-C$ series circuit.

Part A

What is the impedance of the circuit?

Express your answer in ohms.

$$Z = 550 \Omega$$

[Submit](#)

[Previous Answers](#)

Correct

Correct answer is shown. Your answer 551.97Ω was either rounded differently or used a different number of significant figures than required for this part.

Important: If you use this answer in later parts, use the full unrounded value in your calculations.

Part B

What is the current amplitude?

Express your answer in amperes.

$I =$ A

Pearson

▼ **Part C**

What is the phase angle of the source voltage with respect to the current?

Express your answer in degrees.

□ V AΣφ ↶ ↷ ⟳ ⌨ ?

$\phi =$ °

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▼ **Part D**

Does the source voltage lag or lead the current?

- the voltage lags the current
- the voltage leads the current

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▼ Part E



What is the voltage amplitude across the resistor?

Express your answer in volts.

$$V_R = 7.8 \text{ V}$$

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✓ **Correct**

Correct answer is shown. Your answer 7.824 V was either rounded differently or used a different number of significant figures than required for this part.

▼ Part F

What is the voltage amplitude across the inductor?

Express your answer in volts.



$$V_L =$$

V

▼ **Part G**

What is the voltage amplitudes across the capacitor?

Express your answer in volts.

◻ $\sqrt{◻}$ AΣΦ ↶ ↷ ⟳ ⌨️ ?

$V_C =$ V

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▼ Part H

Explain how it is possible for the voltage amplitude across the capacitor to be greater than the voltage amplitude across the source.

Drag the terms on the left to the appropriate blanks on the right to complete the sentences.

Reset

Help

90°

180°

$v_L - v_R$

$v_L + v_R$

$v_R + v_C - v_L$

negative

$v_R - v_C - v_L$

$v_R + v_C + v_L$

positive

$v_R - v_C + v_L$

At any instant, v is equal to .

But v_C and v_L are out of phase,
so v_C can be larger than v at a value of t , if
 is at that t .

Exercise 31.14

◀ 2 of 18 ▶

Review | Constants

A $220\ \Omega$ resistor, a $0.800\ H$ inductor, and a $6.00\ \mu F$ capacitor are connected in series across a voltage source that has voltage amplitude $28.0\ V$ and an angular frequency of $260\ rad/s$.

▼ Part A

What is v at $t = 21.0\ ms$?

Express your answer with the appropriate units.

The calculator interface includes a numeric keypad, a clear button, a backspace button, a decimal point, and a unit selection button labeled μA . Below the calculator are two input fields: "Value" and "Units".

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▼ Part B

What is v_R at $t = 21.0\ ms$?

Express your answer with the appropriate units.

The calculator interface is identical to Part A, featuring a numeric keypad, a clear button, a backspace button, a decimal point, and a unit selection button labeled μA . Below the calculator are two input fields: "Value" and "Units".

▼ Part C

What is v_L at $t = 21.0 \text{ ms}$?

Express your answer with the appropriate units.



$v_L =$

Submit

[Request Answer](#)

▼ Part D

What is v_C at $t = 21.0 \text{ ms}$?

Express your answer with the appropriate units.



$v_C =$

Submit

[Request Answer](#)

▼ Part E

Compare $v_C + v_L + v_R$ and v at this instant:

- $v_C + v_L + v_R < v$
- $v_C + v_L + v_R = v$
- $v_C + v_L + v_R > v$

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▼ Part F

What is V_R ?

Express your answer with the appropriate units.



$V_R =$

Value

Units

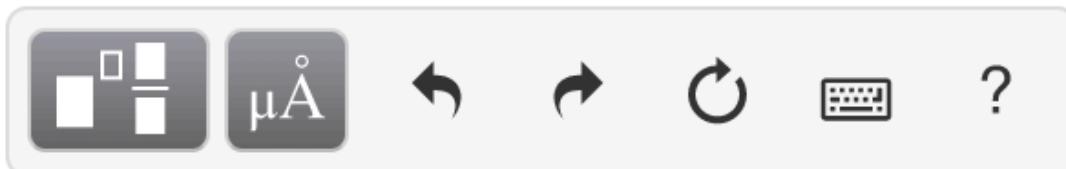
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▼ Part G

What is V_C ?

Express your answer with the appropriate units.



$V_C =$

Value

Units

Submit

[Request Answer](#)

▼ Part H

What is V_L ?

Express your answer with the appropriate units.



$V_L =$

Value

Units

Submit

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▼ **Part I**

Compare V and $V_L + V_C + V_R$:

- $V_L + V_R + V_C > V$
- $V_L + V_R + V_C < V$
- $V_L + V_R + V_C = V$

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Exercise 31.15 - Enhanced - with Feedback

In an $L-R-C$ series circuit, the rms voltage across the resistor is 35.0 V, across the capacitor it is 90.0 V, and across the inductor it is 55.0 V.

Part A

What is the rms voltage of the source?

Express your answer with the appropriate units.

$V =$

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Exercise 31.21

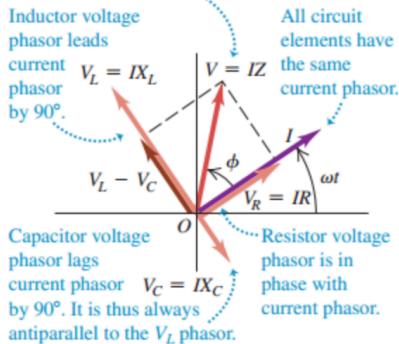
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Figure

1 of 2

(b) Phasor diagram for the case $X_L > X_C$

Source voltage phasor is the vector sum of the V_R , V_L , and V_C phasors.



Use (Figure 1) and (Figure 2) to find $\cos \phi$ for a series L - R - C circuit.

Express your answer in terms of the variables V , I , and R .

$$\cos \phi = \frac{IR}{V}$$

[Previous Answers](#) **Correct**

Part A

Use the result of part A in Equation $P_{av} = \frac{1}{2}VI\cos \phi$ to find the average power delivered by the source.

Express your answer in terms of the variables I and R .

$$P_{av} =$$

▼ **Part C**

In an $L-R-C$ series circuit the amplitude of the source voltage is 120 V, the source voltage leads the current by 53.1° , and the average power supplied by the source is 80.0 W. What is the resistance R of the resistor in the circuit?

Express your answer with the appropriate units.

$R =$

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Exercise 31.23 - Enhanced - with Feedback

An $L-R-C$ series circuit $L = 0.115 \text{ H}$, $R = 240 \Omega$, and $C = 7.31 \mu\text{F}$ carries an rms current of 0.448 A with a frequency of 400 Hz .

Part A

What is the phase angle?

Express your answer in radians.

The interface includes a toolbar with icons for square root, AΣφ, backspace, forward, redo, keyboard, and help. Below the toolbar is a text input field containing $\phi =$ followed by a blank rectangular box for the answer, with the unit "radians" to its right.

Submit[Request Answer](#)**Part B**

What is the power factor for this circuit?

The interface is identical to Part A, featuring a toolbar with square root, AΣφ, backspace, forward, redo, keyboard, and help. Below the toolbar is a large empty rectangular input field for the answer.

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Exercise 31.23 - Enhanced - with Feedback

(<) 5 of 18 (>)

An $L-R-C$ series circuit $L = 0.115 \text{ H}$, $R = 240 \Omega$, and $C = 7.31 \mu\text{F}$ carries an rms current of 0.448 A with a frequency of 400 Hz .

Review | Constants**▼ Part A**

What is the phase angle?

Express your answer in radians.

$$\phi = 0.77 \text{ radians}$$

Submit[Previous Answers](#)**✓ Correct**

Correct answer is shown. Your answer 0.774 radians was either rounded differently or used a different number of significant figures than required for this part.

▼ Part B

What is the power factor for this circuit?

$$0.72$$

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▼ Part C

What is the impedance of the circuit?

Express your answer in ohms.

$$Z = 340 \Omega$$

Submit

[Previous Answers](#)



Correct

Correct answer is shown. Your answer 335.61Ω was either rounded differently or used more significant figures than required for this part.

Important: If you use this answer in later parts, use the full unrounded value.

▼ Part D

What is the rms voltage of the source?

Express your answer in volts.



$A\Sigma\phi$



$$V_{rms} =$$

V

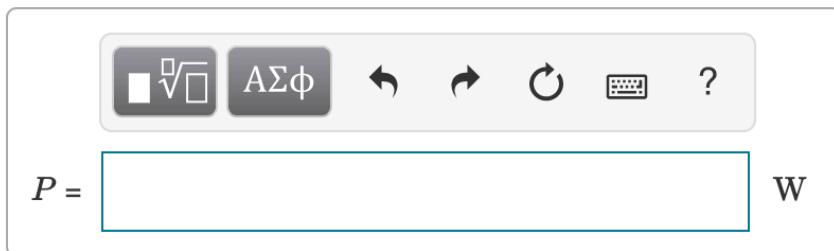
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▼ Part E

What average power is delivered by the source?

Express your answer in watts.



A digital calculator interface with a light gray background. At the top, there are four buttons: a square root button with a small square icon, an 'AΣφ' button, a left arrow, and a right arrow. To the right of these are a refresh button, a keyboard icon, and a question mark icon. Below this toolbar is a text input field containing the formula $P =$. To the right of the input field is a unit indicator 'W'. The entire interface is enclosed in a thin gray border.

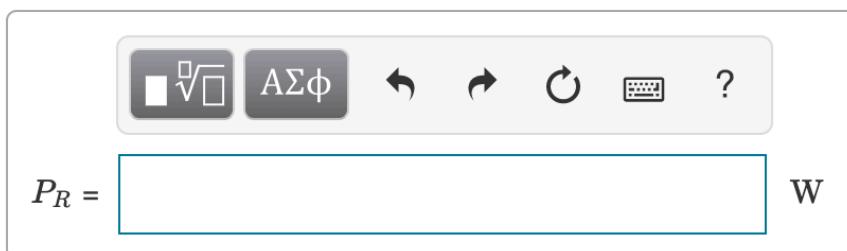
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▼ Part F

What is the average rate at which electrical energy is converted to thermal energy in the resistor?

Express your answer in watts.



A digital calculator interface with a light gray background, identical to the one in Part E. It features a toolbar at the top with a square root button, an 'AΣφ' button, left and right arrows, a refresh button, a keyboard icon, and a question mark icon. Below the toolbar is a text input field containing the formula $P_R =$. To the right of the input field is a unit indicator 'W'. The entire interface is enclosed in a thin gray border.

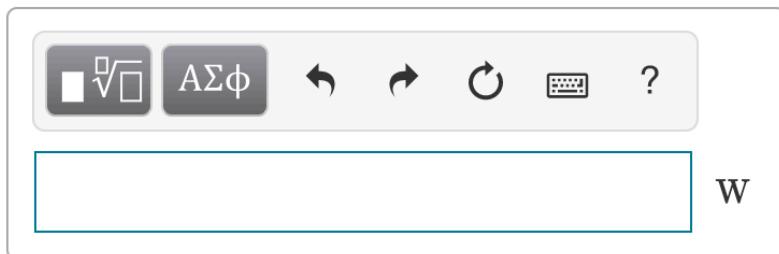
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▼ Part G

What is the average rate at which electrical energy is dissipated (converted to other forms) in the capacitor?

Express your answer in watts.



A digital calculator interface with a light gray background. At the top, there are four buttons: a square root button ($\sqrt{\square}$), an integration button ($\int \Sigma \phi$), a back arrow, a forward arrow, a refresh/circular arrow, a keyboard icon, and a question mark icon. Below these buttons is a large, empty rectangular input field with a thin blue border. In the bottom right corner of the input field, the letter 'W' is displayed, indicating the unit for the answer.

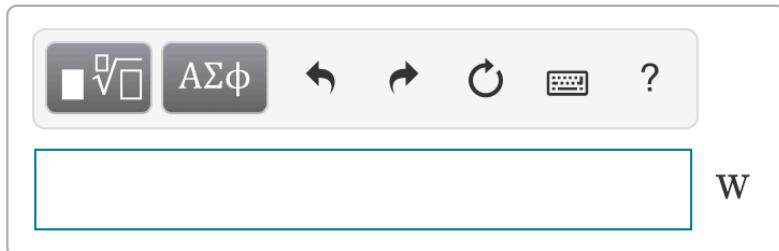
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▼ Part H

What is the average rate at which electrical energy is dissipated (converted to other forms) in the inductor?

Express your answer in watts.



A digital calculator interface with a light gray background, identical to the one in Part G. It features the same set of buttons at the top: square root, integration, back arrow, forward arrow, refresh, keyboard, and question mark. A large, empty rectangular input field with a blue border occupies the center. In the bottom right corner of the input field, the letter 'W' is displayed.

Submit

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▼ **Part A**

At what frequency will the current in the circuit be greatest?

Express your answer in radians per second.

■ $\sqrt{\square}$ AΣφ ↶ ↷ ⟳ ⌨️ ?

$\omega =$ rad/s

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▼ **Part B**

What will be the current amplitude at this frequency?

Express your answer with the appropriate units.

■ $\frac{d}{dt}$ μA ↶ ↷ ⟳ ⌨️ ?

$I =$ *Value* *Units*

▼ **Part C**

What will be the current amplitude at an angular frequency of 395 rad/s?

Express your answer with the appropriate units.

□□
□ μA ↶ ↷ ⟳ ⌨ ?

$I =$ Value Units

Submit

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▼ **Part D**

At this frequency, will the source voltage lead or lag the current?

- the source voltage leads the current
- the source voltage lags the current

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Exercise 31.30

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✓ Complete

Review | Constants

An $L\text{-}R\text{-}C$ series circuit consists of a source with voltage amplitude 120 V and angular frequency 50.0 rad/s, a resistor with $R = 400 \Omega$, an inductor with $L = 3.00 \text{ H}$, and a capacitor with capacitance C .

For what value of C will the current amplitude in the circuit be a maximum?

Express your answer with the appropriate units.

$$C = 1.3 \times 10^{-4} \text{ F}$$

[Previous Answers](#)

✓ Correct

Correct answer is shown. Your answer $1.33 \cdot 10^{-4} \text{ F}$ was either rounded differently or used a different number of significant figures than required for this part.

▼ Part B

✓

When C has the value calculated in the previous part, what is the amplitude of the voltage across the inductor?

Express your answer with the appropriate units.

$$V = 45 \text{ V}$$

[Previous Answers](#)

Exercise 31.35 - Enhanced - with Solution

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A transformer connected to a 150 V (rms) ac line is to supply 15.0 V (rms) to a portable electronic device. The load resistance in the secondary is 5.10 Ω.

For related problem-solving tips and strategies, you may want to view a Video Tutor Solution of [Wake up and smell the \(transformer\)!](#).

Review | Constants

Part A

What should the ratio of primary to secondary turns of the transformer be?

$$\frac{N_1}{N_2} = \text{_____}$$

Submit [Request Answer](#)

Part B

What rms current must the secondary supply?

Express your answer with the appropriate units.

$$I_{\text{rms}} = \text{Value } \text{Units}$$

Submit [Request Answer](#)

▼ Part C



What average power is delivered to the load?

Express your answer with the appropriate units.

$$P = 44.1 \text{ W}$$

[Submit](#)

[Previous Answers](#)

✓ Correct

Correct answer is shown. Your answer 44.12 W was either rounded differently or used a different number of significant figures than required for this part.

$$P_{\text{av}} = I_2^2 R = (2.94 \text{ A})^2 (5.10 \Omega) = 44.1 \text{ W}.$$

▼ Part D

What resistance connected directly across the source line (which has a voltage of 150 V) would draw the same power as the transformer?

Express your answer with the appropriate units.



$R =$

Problem 31.40

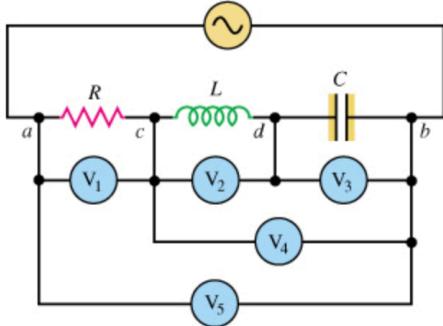
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Review | Constants

Five infinite-impedance voltmeters, calibrated to read rms values, are connected as shown in figure (Figure 1). Let $R = 200 \Omega$, $L = 0.400 \text{ H}$, $C = 6.00 \mu\text{F}$ and $V = 30.0 \text{ V}$.

Figure

◀ 1 of 1 ▶

**Part A**

What is the reading of the voltmeter V_1 if $\omega = 200 \text{ rad/s}$?

Express your answer in volts.

$$V_1 = \quad \text{V}$$

Submit**Request Answer****Part B**

What is the reading of the voltmeter V_2 if $\omega = 200 \text{ rad/s}$?

Express your answer in volts.

$$V_2 = \quad \text{V}$$

▼ **Part C**

What is the reading of the voltmeter V_3 if $\omega = 200 \text{ rad/s}$?

Express your answer in volts.

A calculator-style interface with a numeric keypad and function keys. The numeric keypad shows digits 1 through 9, 0, and decimal points. Function keys include square root, sine, cosine, tangent, and other mathematical operations. A keyboard icon and a question mark icon are also present.

$$V_3 = \boxed{\hspace{10em}} \text{ V}$$

Submit

[**Request Answer**](#)

▼ **Part D**

What is the reading of the voltmeter V_4 if $\omega = 200 \text{ rad/s}$?

Express your answer in volts.

A calculator-style interface with a numeric keypad and function keys. The numeric keypad shows digits 1 through 9, 0, and decimal points. Function keys include square root, sine, cosine, tangent, and other mathematical operations. A keyboard icon and a question mark icon are also present.

$$V_4 = \boxed{\hspace{10em}} \text{ V}$$

Submit

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▼ **Part E**

What is the reading of the voltmeter V_5 if $\omega = 200 \text{ rad/s}$?

Express your answer in volts.



A digital calculator interface with a light gray background. At the top left are two buttons: one with a square root symbol and another with the Greek letter Σ . To the right of these are five standard calculator icons: a back arrow, a forward arrow, a refresh/circular arrow, a keyboard icon, and a question mark icon.

$$V_5 = \boxed{\hspace{10em}} \text{ V}$$

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▼ Part F

What is the reading of the voltmeter V_1 if $\omega = 1000 \text{ rad/s}$?

Express your answer in volts.

■ $\sqrt[n]{\square}$ AΣφ ↶ ↷ ⟳ ⌨ ?

$V_1 =$ V

Submit

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▼ Part G

What is the reading of the voltmeter V_2 if $\omega = 1000 \text{ rad/s}$?

Express your answer in volts.

■ $\sqrt[n]{\square}$ AΣφ ↶ ↷ ⟳ ⌨ ?

$V_2 =$ V

▼ **Part H**

What is the reading of the voltmeter V_3 if $\omega = 1000 \text{ rad/s}$?

Express your answer in volts.



A calculator-style interface with a light gray background. At the top left are two buttons: one with a square root symbol and another with Greek letters $\Sigma\phi$. To the right of these are five standard calculator icons: backspace, forward, refresh, keyboard, and a question mark.

$V_3 =$

V

Submit

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▼ **Part I**

What is the reading of the voltmeter V_4 if $\omega = 1000 \text{ rad/s}$?

Express your answer in volts.



A calculator-style interface with a light gray background. At the top left are two buttons: one with a square root symbol and another with Greek letters $\Sigma\phi$. To the right of these are five standard calculator icons: backspace, forward, refresh, keyboard, and a question mark.

$V_4 =$

V

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[**Request Answer**](#)

▼ **Part J**

What is the reading of the voltmeter V_5 if $\omega = 1000 \text{ rad/s}$?

Express your answer in volts.



AΣΦ



$V_5 =$

V

Submit

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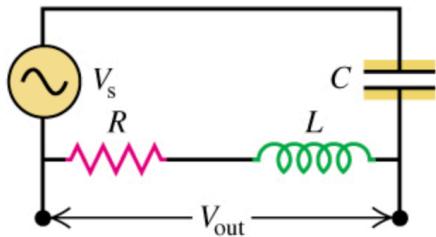
Problem 31.47

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One application of $L\text{-}R\text{-}C$ series circuits is to high-pass or low-pass filters, which filter out either the low- or high-frequency components of a signal. A high-pass filter is shown in the figure (Figure 1), where the output voltage is taken across the $L\text{-}R$ combination. (The $L\text{-}R$ combination represents an inductive coil that also has resistance due to the large length of wire in the coil.)

Review | Constants**Figure**

◀ 1 of 1 ▶

**Part A**

Derive an expression for $\frac{V_{\text{out}}}{V_s}$, the ratio of the output and source voltage amplitudes, as a function of the angular frequency ω of the source.

Express your answer in terms of some or all of the variables L , R , C , and ω .

$$\boxed{\frac{V_{\text{out}}}{V_s}}$$

$$A\Sigma\phi$$

**Submit**[Request Answer](#)**Part B** Complete previous part(s)**Part C** Complete previous part(s)[Provide Feedback](#)[Next ▶](#)

▼ **Part B**

What will be the ratio when ω is *small*?

Express your answer in terms of some or all of the variables L , R , C , and ω .

■ $\sqrt[3]{\square}$ AΣΦ ↶ ↷ ⟳ ⌨ ?

$$\frac{V_{\text{out}}}{V_s} = \boxed{\quad}$$

Submit

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▼ **Part C**

What will be the ratio when ω is *large*?

Express your answer in terms of some or all of the variables L , R , C , and ω .

■ $\sqrt[n]{\square}$ AΣΦ ↶ ↷ ⟳ ⌨️ ?

$$\frac{V_{\text{out}}}{V_s} =$$

Submit

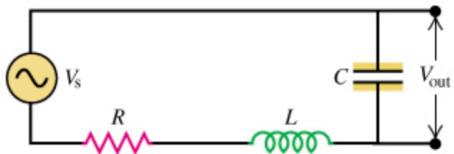
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Problem 31.48

Figure shows (Figure 1) a low-pass filter; the output voltage is taken across the capacitor in an $L\text{-}R\text{-}C$ series circuit.

Figure

◀ 1 of 1 ▶

▼ **Part A**

Derive an expression for V_{out}/V_s , the ratio of the output and source voltage amplitudes, as a function of the angular frequency ω of the source.

- $\frac{V_{\text{out}}}{V_s} = \frac{1}{\omega C \sqrt{R^2 + (\omega L - \frac{1}{\omega C})^2}}$
- $\frac{V_{\text{out}}}{V_s} = \frac{1}{\omega C \sqrt{R^2 - (\omega L - \frac{1}{\omega C})^2}}$
- $\frac{V_{\text{out}}}{V_s} = \frac{1}{\omega C \sqrt{R^2 - (\omega L + \frac{1}{\omega C})^2}}$
- $\frac{V_{\text{out}}}{V_s} = \frac{1}{\omega C \sqrt{R^2 + (\omega L + \frac{1}{\omega C})^2}}$

Submit**Request Answer**▼ **Part B**

▼ **Part B**

Find an expression for V_{out}/V_s when ω is large.

- 1
- $\frac{1}{(L C) \omega^2}$
- $\frac{1}{(L C) \omega}$
- $(L C) \omega^2$

Submit

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▼ **Part C**

Find an expression for V_{out}/V_s in the limit of small frequency

- 1
- $\frac{1}{(L C) \omega^2}$
- $\frac{1}{(L C) \omega}$
- $(L C) \omega^2$

Problem 31.49

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An L - R - C series circuit is connected to an ac source of constant voltage amplitude V and variable angular frequency ω .

[Review | Constants](#)**Part A**

Find the current amplitude, as a function of ω .

Express your answer in terms of the variables V , R , L , C , and ω .

$$I(\omega) = \frac{V}{\sqrt{R^2 + \left(\frac{1}{\omega C} - \omega L\right)^2}}$$

[Submit](#)[Previous Answers](#) **Correct****Part B**

Find the average power dissipated in the resistor.

Express your answer in terms of the variables V , R , L , C , and ω .

$$P_{av} = \frac{V^2 R}{2 \left(R^2 + \left(\frac{1}{\omega C} - \omega L \right)^2 \right)}$$

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▼ **Part C**

At what angular frequency will I and P_{av} be *both* maximum?

Express your answer in terms of some or all of the variables R , L , and C .

$$\omega = \sqrt{\frac{1}{LC}}$$

Submit

[Previous Answers](#)

✓ **Correct**

This is the resonance frequency of the circuit.

Problem 31.50

13 of 18

An $L-R-C$ series circuit is connected to an ac source of constant voltage amplitude V and variable angular frequency ω .

Review | Constants

Part A

Find an expression for the amplitude V_L of the voltage across the inductor as a function of ω .

Express your answer in terms of some or all of the variables V , ω , L , R , and C .

A digital equation editor interface with a toolbar at the top containing buttons for square root, absolute value, and other mathematical operations. Below the toolbar is a text input field containing the variable $V_L =$.
 $V_L =$ **Submit**[Request Answer](#)**Part B**

Find an expression for the amplitude V_C of the voltage across the capacitor as a function of ω .

Express your answer in terms of some or all of the variables V , ω , L , R , and C .

A digital equation editor interface with a toolbar at the top containing buttons for square root, absolute value, and other mathematical operations. Below the toolbar is a text input field containing the variable $V_C =$.
 $V_C =$

▼ Part C

Discuss the behavior of V_L and V_C relative to V in the limits $\omega = 0$ and $\omega \rightarrow \infty$.

Drag the terms on the left to the appropriate blanks on the right to complete the sentences.

Reset

Help

When the angular frequency is zero, the voltage across the inductor is equal to and the voltage across the capacitor is equal to .

At very high frequencies, the voltage across the inductor is equal to and the voltage across the capacitor is equal to .

▼ **Part D**

For what value of ω is $V_L=V_C$?

Express your answer in terms of some or all of the variables L , R , and C .

$\omega =$

Submit

[Request Answer](#)

Problem 31.54

◀ 14 of 18 ▶

A resistor, inductor, and capacitor are connected in parallel to an ac source with voltage amplitude V and angular frequency ω . Let the source voltage be given by $v = V \cos \omega t$.

Review | Constants**▼ Part A**

Compare the instantaneous voltages v_R , v_L , and v_C at any instant with the source voltage v .

- $v = v_R + v_L + v_C$
- $v > v_R + v_L + v_C$
- $v = v_R = v_L = v_C$
- $v < v_R + v_L + v_C$

Submit[Request Answer](#)**▼ Part B**

Compare the instantaneous currents i_R , i_L , and i_C at any instant with the source current i .

- $i = i_R + i_L + i_C$
- $i < i_R + i_L + i_C$
- $i > i_R + i_L + i_C$
- $i = i_R = i_L = i_C$

▼ **Part C**

What is the phase of i_R with respect to v ?

Express your answer in degrees.



i_R leads the voltage v by $\phi =$

Submit

[Request Answer](#)

▼ **Part D**

What is the phase of i_L with respect to v ?

Express your answer in degrees.



i_L lags the voltage v by $\phi =$

▼ **Part E**

What is the phase of i_C with respect to v ?

Express your answer in degrees.

i_C leads the voltage v by $\phi =$ °

▼ **Part G**

Use the phasor diagram of part (e) to find the current amplitude I for the current i through the source..

Express your answer in terms of the variables I_R , I_C and I_L .

■ $\sqrt{\square}$ AΣφ ↶ ↷ ⟳ ⌨️ ?

I =

Submit

[Request Answer](#)

Problem 31.57

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An L - R - C series circuit consists of a $2.40 \mu\text{F}$ capacitor, a 6.00 mH inductor, and a 65.0Ω resistor connected across an ac source of voltage amplitude 20.0 V having variable frequency.

Review | Constants**Part A**

At what frequency is the average power delivered to the circuit equal to $\frac{1}{2}V_{\text{rms}}I_{\text{rms}}$?

Express your answer in radians per second.

The interface includes a toolbar with buttons for square root, AΣφ, backspace, forward, redo, keyboard, and help. Below the toolbar is a text input field containing the equation $\omega =$, followed by a unit indicator "rad/s".

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Part B

Under the conditions of part A, what is the average power delivered to each circuit element?

Express your answers in watts separated by commas.

The interface includes a toolbar with buttons for square root, AΣφ, backspace, forward, redo, keyboard, and help. Below the toolbar is a text input field containing the equation $P_R, P_C, P_L =$, followed by a unit indicator "W".

▼ **Part C**

What is the maximum current through the capacitor?

Express your answer in amperes.



$I_C =$

A

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Problem 31.61

◀ 16 of 18 ▶

✓ Complete

A resistance R , capacitance C , and inductance L are connected in series to a voltage source with amplitude V and variable angular frequency ω .

■ Review | Constants

▼ Part A



If $\omega = \omega_0$, the resonance angular frequency, find the maximum current in the resistor.

Express your answer in terms of some or all of the variables R , C , L , and V .

$$I_{max} = \frac{V}{R}$$

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✓ Correct

▼ Part B



Find the maximum voltage across the capacitor.

Express your answer in terms of some or all of the variables R , C , L , and V .

$$V_C = \frac{V\sqrt{LC}}{RC}$$

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[Previous Answers](#)

▼ Part C

Find the maximum voltage across the inductor.

Express your answer in terms of some or all of the variables R , C , L , and V .

$$V_L = \frac{VL}{R\sqrt{LC}}$$

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[Previous Answers](#)

 **Correct**

▼ Part D

Find the maximum energy stored in the capacitor.

Express your answer in terms of some or all of the variables R , C , L , and V .

$$U_C = \frac{1}{2} \frac{V^2 L}{R^2}$$

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▼ **Part E**

Find the maximum energy stored in the inductor.

Express your answer in terms of some or all of the variables R , C , L , and V .

$$U_L = \frac{1}{2} \frac{LV^2}{R^2}$$

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 **Correct**

Challenge Problem 31.67

In an L - R - C series circuit the current is given by $i = I \cos \omega t$. The voltage amplitudes for the resistor, inductor, and capacitor are V_R , V_L and V_C .

Part A

Find the instantaneous power into the resistor is p_R .

Express your answer in terms of the variables V_R , I , ω , and t .

The calculator interface includes a top row with a square root button ($\sqrt{\square}$), a multiplication button ($A\Sigma\Phi$), and standard navigation icons (back, forward, refresh, keyboard, help). Below this is a grid of mathematical symbols:

α	β	γ	δ	ϵ	η	θ	κ	λ	μ
ν	π	ρ	σ	τ	ϕ	χ	ψ	ω	
Δ	Σ	Φ	Ψ	Ω	\hbar	ε	\times	Ans	

The input field contains the expression $p_R = IV_R \cos \omega t$.

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Part B

What does this expression give for the average power into the resistor?

Express your answer in terms of the variables V_R and I .

$$p_{av}(R) = \frac{1}{2}V_R I$$

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[Previous Answers](#)

Correct

Part C

Find the instantaneous power into the inductor is p_L .

Express your answer in terms of the variables V_L , I , ω , and t .



$$p_L =$$

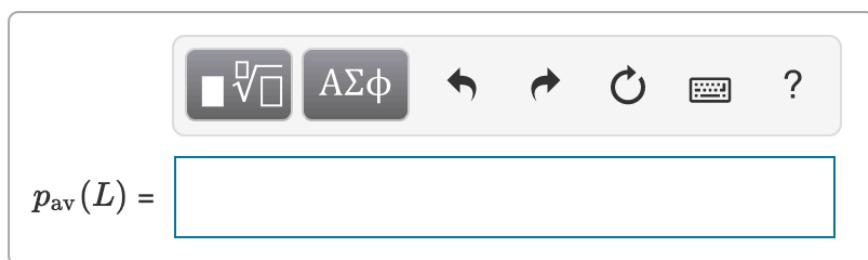
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▼ Part D

What does this expression give for the average power into the inductor?

Express your answer in terms of the variables V_L and I .



A digital calculator interface with a light gray background. At the top, there is a toolbar with the following icons from left to right: a square root button ($\sqrt{\square}$), a button labeled "AΣΦ", a left arrow, a right arrow, a circular refresh button, a keyboard icon, and a question mark icon. Below the toolbar is a large input field containing the mathematical expression $p_{\text{av}}(L) =$. The entire interface is enclosed in a thin black border.

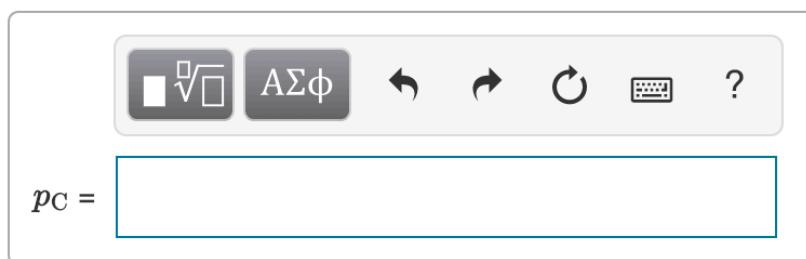
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▼ Part E

Find the instantaneous power into the capacitor is p_C .

Express your answer in terms of the variables V_C , I , ω , and t .



A digital calculator interface with a light gray background. At the top, there is a toolbar with the following icons from left to right: a square root button ($\sqrt{\square}$), a button labeled "AΣΦ", a left arrow, a right arrow, a circular refresh button, a keyboard icon, and a question mark icon. Below the toolbar is a large input field containing the mathematical expression $p_C =$. The entire interface is enclosed in a thin black border.

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▼ Part F

What does this expression give for the average power into the capacitor?

Express your answer in terms of the variables V_C and I .

■ $\sqrt{\square}$ AΣφ ↶ ↷ ⟳ ⌨️ ?

$p_{av}(C) =$

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▼ Part G

If the instantaneous power delivered by the source is $p = VI \cos \omega t (\cos \phi \cos \omega t - \sin \phi \sin \omega t)$, compare it with $p_R + p_L + p_C$ at each instant of time.

- $p = p_R + p_L + p_C$
- $p < p_R + p_L + p_C$
- $p > p_R + p_L + p_C$

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Challenge Problem 31.68

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Review | Constants

▼ Part A

At what angular frequency is the voltage amplitude across the *resistor* in an *L-R-C* series circuit at maximum value?

Express your answer in terms of some or all of the variables *L*, *C*, and *R*.



The interface includes a toolbar with a square root button ($\sqrt{\square}$), a symbol for complex numbers ($A\Sigma\phi$), and other mathematical operators. Below the toolbar is a text input field containing the variable $\omega =$.

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▼ Part B

At what angular frequency is the voltage amplitude across the *inductor* at maximum value?

Express your answer in terms of some or all of the variables *L*, *C*, and *R*.



The interface is identical to Part A, featuring a toolbar with a square root button ($\sqrt{\square}$), a symbol for complex numbers ($A\Sigma\phi$), and other mathematical operators. Below the toolbar is a text input field containing the variable $\omega =$.

▼ **Part C**

At what angular frequency is the voltage amplitude across the *capacitor* at maximum value?

Express your answer in terms of some or all of the variables L , C , and R .

■ $\sqrt{\square}$ AΣφ ↶ ↷ ⟳ ⌨ ?

$\omega =$

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