

QUICK REVIEW

Quick Review: Damping, Driving, and Resonance — Algebra-Based

Refresh the most important ideas about damping, driving, and resonance from the Algebra-Based perspective in just a few minutes.

 TIME 5–10 minutes	 BEST FOR A rapid refresh	 FINISH WITH Key ideas refreshed
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After this quick review, you'll be able to...

calculate damping and response quantities, compare driving and natural frequencies, and interpret resonance quantitatively.

HOW TO USE THIS GUIDE

Work through the four stages in order. Write directly in the spaces provided, check your work in the Quick Answers section, and finish by choosing the next resource that matches your confidence.

Choose how you want to review: work through this guide, follow the online review, or watch the video review.

[Start the Review Online →](#)

[Watch the Video Review →](#)

YOU WILL NEED

Pencil or pen • Calculator if needed • Approximately 5–10 minutes

FR-02 • COURSE ALIGNMENT

Course Alignment

This Physics Sensei Unit Review supports MEC-U10 — Damping, Driving, and Resonance. Use it to reinforce concepts, prepare for homework, or review before a quiz or exam.

UNIT: MEC-U10 TOPIC: Damping, Driving, and Resonance TREATMENT: Algebra-Based RESOURCE: Physics Sensei Unit Review	BEST USED ✓ After reading the chapter ✓ Before starting homework ✓ Before a quiz or exam
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Explore Physics Sensei →

Physics Sensei is an independent physics learning resource. This review uses original Physics Sensei organization, explanations, examples, and practice.

FR-03 • YOUR REVIEW PLAN

Your Review Plan

Complete these four stages to quickly refresh the essential ideas and confirm you're ready to continue.

4 stages • Approximately 5–10 minutes

1 Quick Recall — page 4 Refresh what you already know.	2 Essential Idea — page 5 Review the most important concept.
3 Confidence Check — page 6 Confirm you're ready to move on.	4 Next Step — page 8 Continue your learning.

PRINTING TIP

For student copies, print double-sided and keep the Quick Answers section after the student activities so learners attempt each activity before checking their work.

FR-04 • STAGE 1 OF 4

Quick Recall

Let's quickly refresh what you already know. This short recall activity will bring the most important ideas back to mind before you review them.

QUICK RECALL**Recall Activity**

Complete the three statements from memory before revealing the answer.

1) The undamped natural angular frequency is $\omega_0 = \underline{\hspace{1cm}}$. 2) Critical damping occurs at $b = \underline{\hspace{1cm}}$. 3) For weak damping, larger Q means a $\underline{\hspace{1cm}}$ resonance peak.

Ready to refresh the essentials?

Great! Now review the most important idea you'll want to remember.

Continue to Essential Idea — page 5 →

FR-05 • STAGE 2 OF 4

Essential Idea

Take one last look at the most important concept from this topic. If you remember this idea, the rest will come back much more easily.

ESSENTIAL IDEA

Compare Damping and Driving to the Natural Oscillator Scale

For a mass-spring oscillator, $\omega_0 = \sqrt{k/m}$. Viscous damping $F_d = -bv$ removes energy. Critical damping is $b_c = 2\sqrt{km}$. Under periodic driving, the response amplitude depends strongly on how the driving angular frequency compares with ω_0 and on the damping strength.

$$\mathbf{v} = d\mathbf{r}/dt; \mathbf{a} = d\mathbf{v}/dt; \text{projectile: } \mathbf{a}_x = 0 \text{ and } \mathbf{a}_y = -\mathbf{g}; \text{circular: } \mathbf{a}_{\text{rad}} = \mathbf{v}^2/r; \text{relative:}$$

$$\mathbf{v}_{A/C} = \mathbf{v}_{A/B} + \mathbf{v}_{B/C}$$

EXAMPLE For $m = 2.0 \text{ kg}$ and $k = 50 \text{ N/m}$, $\omega_0 = 5.0 \text{ rad/s}$ and $b_c = 20 \text{ N}\cdot\text{s/m}$. A driver near 5 rad/s can produce a strong response if b is well below $20 \text{ N}\cdot\text{s/m}$.

SENSEI NOTE For a damped oscillator, maximum displacement response is generally slightly below ω_0 ; “resonance equals exactly ω_0 ” is only a weak-damping approximation.

Ready to check your memory?

You’ve refreshed the essential idea. Now see how much you remember before moving on.

Continue to Confidence Check — page 6 →

FR-06 • STAGE 3 OF 4

Confidence Check

You've refreshed the essential idea. Now answer this quick confidence check to confirm you're ready to move on.

CONFIDENCE CHECK

Five-Minute Readiness Check

Answer all three without notes.

A 2.0 kg oscillator has $k = 50 \text{ N/m}$ and $b = 4.0 \text{ N-s/m}$. Is it underdamped, critically damped, or overdamped? Is its resonance expected to be sharp or heavily suppressed?

Ready for your next step?

Great work! You've refreshed the essential idea. Now choose the resource that best matches what you'd like to do next.

Continue to Next Step — page 8 →

QUICK ANSWERS • CHECK AFTER ATTEMPTING

Quick Answers and Explanations

Use these concise answers to check your recall and confidence—not only your final response.

QUICK RECALL

Recall Activity

1) $\sqrt{k/m}$; 2) $2\sqrt{km}$; 3) sharper.

WHY IT WORKS The spring and mass set the natural timescale; the critical damping coefficient separates oscillatory and nonoscillatory return; Q measures how weakly damped and frequency-selective the response is.

CONFIDENCE CHECK

CONFIDENCE CHECK

Five-Minute Readiness Check

$b_c = 20 \text{ N}\cdot\text{s/m}$, so $b < b_c$: underdamped. Because damping is relatively weak, a distinct resonance peak is expected.

WHY IT WORKS Comparing b with b_c identifies the damping regime. Smaller damping also allows stronger amplitude buildup near resonance.

READINESS GUIDE

3 correct: You're ready to continue. • 2 correct: Review the missed idea. • 0–1 correct: Revisit the Essential Idea or choose more practice.

FR-07 • STAGE 4 OF 4

Next Step: Continue Learning

Great work! You've completed this quick review. Choose the next resource that best matches how confident you feel.

? I'm Still Unsure Review the essential idea again. Review again: return to Essential Idea on page 5.	🕒 I Need More Practice Continue with additional practice for this topic. Go to Practice →	✓ I'm Ready Continue to the next recommended resource. Continue →
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RECOMMENDED LINKS

Review again: return to Essential Idea on page 5.

Find additional practice →

Choose another type of physics help →

Continue reviewing with these companion resources.

Start the Review Online →

Watch the Video Review →

PHYSICS HELP THAT MAKES SENSE

A Physics Sensei review never ends at the last question. It always guides you toward the next useful step.

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