

FOCUSED REVIEW

Focused Review — Vector Addition and Subtraction — Calculus-Based

Review the most important ideas, reinforce the essential skills, and confirm you're ready to move on.

 TIME 15–20 minutes	 BEST FOR Focused review	 FINISH WITH Greater confidence
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After this focused review, you'll be able to...

recognize the key concepts, reinforce your problem-solving skills, and continue with greater confidence.

HOW TO USE THIS GUIDE

Work through the stages in order. Write directly in the spaces provided, check your work in the Solutions 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 15–20 minutes

FR-02 • COURSE ALIGNMENT

Course Alignment

This Physics Sensei Topic Review is an independent learning resource. Use it to reinforce key concepts, prepare for homework, or review before a quiz or exam.

Related Unit Review: If you need to review the complete unit material, review [Vectors and Components here →](#)

RESOURCE: Physics Sensei Topic Review TOPIC ID: MEC-U02-T02 TOPIC: Vector Addition and Subtraction PARENT UNIT: MEC-U02 — Vectors and Components COURSE LEVEL: Calculus-Based	BEST USED ✓ After learning the topic ✓ Before starting homework ✓ Before a quiz or exam
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FR-03 • YOUR REVIEW PLAN

Your Review Plan

Complete these six focused stages in order. Each stage reinforces your understanding and prepares you for a final confidence check.

6 stages • Approximately 15–20 minutes

1 Warm-Up Check Refresh key ideas.	2 Core Concepts Reinforce the essentials.	3 Guided Practice Strengthen key skills.
4 Confidence Check Confirm your understanding.	5 Summary Remember the essentials.	6 Next Step Choose your next step.

PRINTING TIP

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

FR-04 • STAGE 1 OF 6

Warm-Up Check

Before you begin, take a minute to reactivate what you already know. This quick warm-up will help you focus on the most important ideas before moving on.

WARM-UP 1**Key Ideas**

Use the fixed basis.

$\vec{A} = A_x \vec{e}_1 + A_y \vec{e}_2$ and $\vec{B} = B_x \vec{e}_1 + B_y \vec{e}_2$. Write $\vec{A} + \vec{B}$.

WARM-UP 2**Common Mistakes**

Treat displacement as a difference.

$\vec{r}_1 = (2, -1)$, $\vec{r}_2 = (-1, 3)$. Find $\Delta \vec{r} = \vec{r}_2 - \vec{r}_1$.

FR-04 • WARM-UP CHECK CONTINUED

WARM-UP 3

Quick Application

Evaluate a linear combination.

$\vec{A} = (1, 2)$, $\vec{B} = (-2, 1)$. Find $2\vec{A} - \vec{B}$.

Ready to strengthen your understanding?

You've refreshed the most important ideas. Now reinforce the concepts you'll use most often.

Continue to Core Concepts →

FR-05 • STAGE 2 OF 6

Core Concepts

Let's reinforce the most important concepts you'll need to solve problems with confidence. Focus on the ideas that appear most often in homework, quizzes, and exams.

KEY CONCEPT 1

Component-Wise Linearity

In a fixed basis, vector addition and subtraction act independently on corresponding scalar components. This structure extends immediately to scalar multiples and linear combinations.

$$\vec{A} \pm \vec{B} = (A_x \pm B_x)\mathbf{e}_1 + (A_y \pm B_y)\mathbf{e}_2$$

EXAMPLE: $\vec{A} = (1, 2)$, $\vec{B} = (-2, 1)$: $2\vec{A} - \vec{B} = (4, 3)$.

SENSEI NOTE: Keep the basis vectors fixed; combine coefficients, not basis directions.

KEY CONCEPT 2

Position Differences Produce Displacements

A displacement is the final position vector minus the initial position vector. Any constant shift of the coordinate origin cancels in the difference, so the displacement represents a geometric separation.

$$\Delta\vec{r} = \vec{r}_2 - \vec{r}_1$$

EXAMPLE: $\vec{r}_1 = (2, -1)$, $\vec{r}_2 = (-1, 3)$: $\Delta\vec{r} = (-3, 4)$, with magnitude 5.

SENSEI NOTE: Do not reverse the subtraction order; $\vec{r}_2 - \vec{r}_1$ and $\vec{r}_1 - \vec{r}_2$ point in opposite directions.

Ready to apply these ideas?

You've reinforced the essential concepts. Now strengthen your problem-solving skills by working through a few guided examples.

[Continue to Guided Practice →](#)

FR-06 • STAGE 3 OF 6

Guided Practice

Now apply the key concepts you've just reviewed. Work through these focused practice activities to reinforce your problem-solving skills before the final confidence check.

PRACTICE 1**Guided Example**

Evaluate the linear combination component by component.

$\vec{A} = (2, -1)$, $\vec{B} = (-3, 4)$. Find $3\vec{A} - 2\vec{B}$.

PRACTICE 2**Independent Check**

Form the final-minus-initial difference.

$\vec{r}_1 = 2\vec{e}_1 - \vec{e}_2$ and $\vec{r}_2 = -\vec{e}_1 + 3\vec{e}_2$. Find $\Delta\vec{r}$ and its magnitude.

Ready for a confidence check?

You've reinforced the essential skills through focused practice. Now confirm your understanding with two short questions.

Continue to Confidence Check →

FR-07 • STAGE 4 OF 6

Confidence Check

You've reinforced the key concepts and practiced the essential skills. Now confirm you're ready to move forward by completing these short confidence checks.

CONFIDENCE CHECK 1

Vector Sum and Difference

Compute both.

$\vec{A} = (1, -2)$, $\vec{B} = (4, 3)$. Find $\vec{A} + \vec{B}$ and $\vec{A} - \vec{B}$.

CONFIDENCE CHECK 2

Displacement from Positions

Find the displacement.

$\vec{r}_1 = (1, 2)$, $\vec{r}_2 = (4, -2)$. Find $\vec{r}_2 - \vec{r}_1$ and its magnitude.

HOW DID IT GO?

I answered ____ of 2 questions correctly.

Use the Solutions section to check your reasoning, then take one final look at the essential ideas.

You've confirmed your understanding.

Take one final look at the essential ideas before choosing your next step.

Continue to Summary →

FR-08 • STAGE 5 OF 6

Summary

Before moving on, take one final look at the essential ideas you'll want to remember.

KEY TAKEAWAY 1**Linearity Is Component-Wise**

Vector sums, differences, and scalar multiples can be evaluated by combining coefficients in a fixed basis.

KEY TAKEAWAY 2**Position Differences Are Geometric**

$\Delta \vec{r} = \vec{r}_2 - \vec{r}_1$ gives a displacement that is independent of a common shift of origin.

MY ONE-SENTENCE SUMMARY

In my own words, the most important idea is:

Ready for your next step?

You've reviewed the essential ideas one last time. Now choose the resource that best matches how confident you feel.

Continue to Next Step →

ANSWER KEY • CHECK AFTER ATTEMPTING

Solutions and Explanations

Use these solutions to check your reasoning—not only your final answer.

WARM-UP • ACTIVITY 1

Key Ideas

$$(A_x + B_x)e_1 + (A_y + B_y)e_2.$$

WHY IT WORKS: A fixed basis lets corresponding scalar components combine independently.

WARM-UP • ACTIVITY 2

Common Mistakes

$$(-3, 4).$$

WHY IT WORKS: Subtracting positions removes any common origin offset.

WARM-UP • ACTIVITY 3

Quick Application

$$(4, 3).$$

WHY IT WORKS: Scale first or distribute componentwise; linearity gives the same result.

SOLUTIONS • GUIDED PRACTICE

PRACTICE 1

Guided Example

$(12, -11)$.

WHY IT WORKS: $3\vec{A} = (6, -3)$ and $2\vec{B} = (-6, 8)$; subtracting gives $(12, -11)$.

PRACTICE 2

Independent Check

$\Delta\vec{r} = -3\mathbf{e}_1 + 4\mathbf{e}_2$; $|\Delta\vec{r}| = 5$.

WHY IT WORKS: The position difference is componentwise and the common origin does not appear in the result.

SOLUTIONS • CONFIDENCE CHECK

CONFIDENCE CHECK 1

Vector Sum and Difference

$$\vec{A} + \vec{B} = (5, 1); \vec{A} - \vec{B} = (-3, -5).$$

WHY IT WORKS: Each operation is applied independently to corresponding components.

CONFIDENCE CHECK 2

Displacement from Positions

(3, -4), with magnitude 5.

WHY IT WORKS: Final minus initial gives the directed separation; the magnitude follows from its components.

READINESS GUIDE

2 correct: You're ready to continue. • 1 correct: Review the missed idea, then continue. • 0 correct: Revisit Core Concepts or choose more practice.

FR-09 • STAGE 6 OF 6

Next Step: Continue Learning

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

? I'm Still Unsure Review the focused review again to strengthen the essential concepts. Review Again →	🎯 I Need More Practice Build confidence with additional practice problems. Go to Practice →	✓ I'm Ready Continue to the next topic or learning resource. Continue →
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RECOMMENDED LINKS

[Review this topic again →](#)

[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.

PhysicsSensei.com