

Algebra vs calculus: the side-by-side chart and a ten-question readiness check

Algebra finds unknown numbers; calculus measures change. Calculus is harder in ideas, easier in structure, and longer in working: most students who fail it fail on the algebra inside it.

Side by side

	Algebra	Calculus
Main question	What is the unknown number?	How fast is it changing; how much has built up?
Main objects	Equations, expressions, functions, lines and parabolas	Limits, derivatives, integrals
Kind of change	None, or steady (constant slope)	Changing (a slope that varies from point to point)
Typical task	Solve $3x + 5 = 20$; factor $x^2 + 7x + 12$	Find the slope of $y = x^2$ at $x = 3$; find the area under it
Graph	A line has one slope	A curve has a slope at every point
When taught (US)	Algebra 1 in grade 8 or 9; Algebra 2 in 10 or 11	Grade 12, or 11 if accelerated
Depends on	Arithmetic	Algebra, geometry and trigonometry

One problem, both ways

Algebra: a car at a steady 60 mph for 3 hours goes $60 \times 3 = 180$ miles. The speed is constant, the distance graph is a straight line, slope 60 everywhere.

Calculus: a car's distance after t seconds is $s = 2t^2$. How fast at $t = 5$? The speed is changing the whole time, so it is the slope of the curve at one point: the derivative of $2t^2$ is $4t$, so $4 \times 5 = 20$ m/s. The other way round: the area under the speed line $4t$ from 0 to 5 is $\frac{1}{2} \times 5 \times 20 = 50$ m, which is 2×5^2 .

Is calculus harder?

Compared with	Is calculus harder?
Algebra 1	Yes, clearly: it comes four courses later
Algebra 2	For most students yes; some strong students found Algebra 2 harder because it is more scattered
Pre-Calculus	About the same workload; Pre-Calculus has more memorising, calculus more reasoning
Linear algebra (university)	Different, not harder: more abstract, less computation

The ten-question readiness check (no calculator, 15 minutes)

- Factor $x^2 - 9$
- Factor $x^2 - 5x + 6$
- Simplify $(x^2 - 4) / (x - 2)$
- Write $1/x^3$ and $\sqrt{x}$ as powers of x
- Expand $(x + h)^2$
- Simplify $1/x - 1/(x + h)$ into one fraction
- Solve $x^2 - 3x - 10 = 0$
- Find the slope of the line through (1, 2) and (4, 11)
- What is $\sin 30^\circ$ and $\cos 60^\circ$?
- If $f(x) = x^2 + 1$, find $f(3)$ and $f(a + 1)$

Answers

- 1) $(x - 3)(x + 3)$ 2) $(x - 2)(x - 3)$ 3) $x + 2$ 4) x to the power -3 , and x to the power $1/2$ 5) $x^2 + 2xh + h^2$
 6) $h / (x(x + h))$ 7) $x = 5$ or $x = -2$ 8) 3 9) $1/2$ and $1/2$ 10) 10, and $a^2 + 2a + 2$

Reading the score

- 9 or 10, quickly** Ready for calculus.
6 to 8 A month of algebra first saves a term.
5 or fewer The problem is in Algebra 2; fix that before the course starts.

Algebra-based and calculus-based physics

	Algebra-based physics	Calculus-based physics
US courses	AP Physics 1 and 2; most high school physics	AP Physics C (Mechanics; Electricity and Magnetism); university physics for engineers
Mathematics used	Algebra and trigonometry; constant-acceleration formulas	Derivatives and integrals; continuously varying forces and speeds
Who needs it	Life sciences, pre-med, general requirements	Engineering, physics, most physical science degrees

Full guide: sciencewithshobha.com/blog/difference-between-algebra-and-calculus-and-is-calculus-harder-than-algebra/