

This sheet covers what BC adds to AB – series, parametric, polar and the language of convergence – because those are where BC-only points are won and lost. The shared calculus vocabulary is on the AB sheet. Convergence answers are marked on NAMING the test and CHECKING its conditions.

BC AB ;

Sequences and series

Sequence – an ordered list of terms indexed by the positive integers

Series – the sum of the terms of a sequence; its value is defined as the limit of the partial sums

Convergence – a series converges when its sequence of PARTIAL SUMS approaches a finite limit – not when its terms approach zero

nth-term test – if the terms do not approach zero, the series diverges; if they do, the test is INCONCLUSIVE

Geometric series – a series with constant ratio r , convergent exactly when $|r| < 1$, with sum $a/(1 - r)$

p-series $\sum 1/n^p$ – the series $\sum 1/n^p$, convergent exactly when $p > 1$; $p = 1$ is the harmonic series and diverges

Absolute convergence – convergence of the series of absolute values; it implies convergence of the original series

Conditional convergence – convergence of a series whose absolute-value series diverges, as for the alternating harmonic series

Alternating series error bound – for a convergent alternating series, the error after n terms is at most the magnitude of the first omitted term

Radius of convergence – half the length of the interval on which a power series converges, found with the ratio test; the ENDPOINTS must be tested separately

Taylor series – a power series representing a function about a point, whose coefficients are its derivatives there divided by n factorial

Lagrange error bound – a bound on the error of a Taylor polynomial, using a maximum of the next derivative on the interval

Parametric, polar and vector functions

Parametric equations – a curve given by $x(t)$ and $y(t)$, where dy/dx is $(dy/dt)/(dx/dt)$

Speed (parametric) – the magnitude of the velocity vector, $\sqrt{(dx/dt)^2 + (dy/dt)^2}$ – a scalar, unlike velocity

Arc length – the integral of speed with respect to the parameter over the interval

Polar coordinates – a point located by its distance r from the origin and the angle θ from the polar axis

Area in polar form – the region swept by a radius is $\int \frac{1}{2}r^2 d\theta$, and the $\frac{1}{2}$ is the mark most often lost

Additional integration

Integration by parts – the reverse of the product rule, $\int u dv = uv - \int v du$

Improper integral – an integral with an infinite limit or an unbounded integrand, evaluated as a limit; it converges only if that limit is finite

Logistic differential equation – $dP/dt = kP(1 - P/L)$, whose solution approaches the carrying capacity L and grows fastest at $L/2$

Euler's method – approximating a solution curve by stepping along tangent lines from an initial condition