AP CALCULUS BC • HOLIDAY HOMEWORK 假期作业

10 Power and Taylor series – Part 2

Name: ____________ Class: ________ Date: __________

Recall

In Part A you added up infinitely many terms. Now use that to **approximate functions**:

- A complicated function can be replaced by a simple polynomial.
- Adding more terms makes the approximation better.

Each idea has a worked example before the Practice.

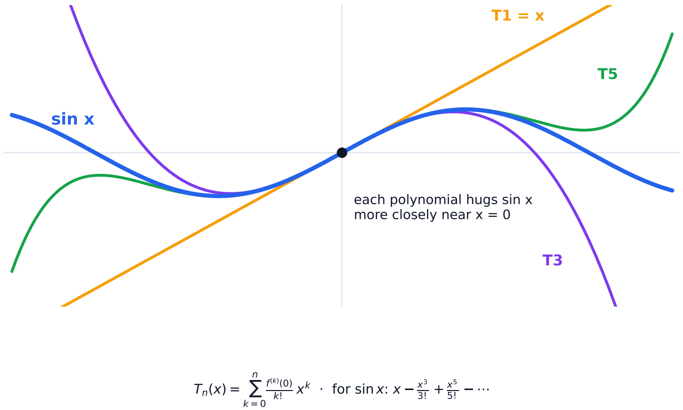
New ideas

1 Power series

A **power series** adds up powers of x: $a_0 + a_1x + a_2x^2 + a_3x^3 + \cdots$. It behaves like an "infinitely long polynomial".

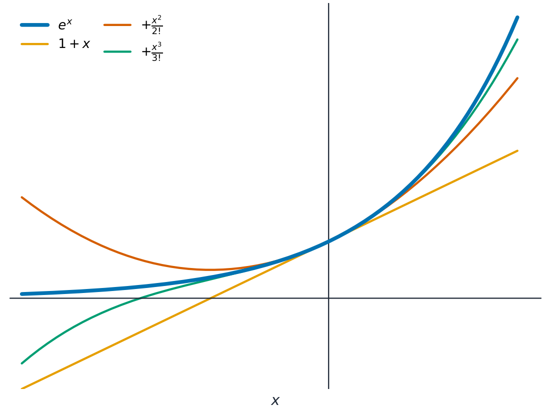
2 Taylor and Maclaurin series

A **Taylor series** (a **Maclaurin series** when centred at 0) builds a power series that matches a function near a point – approximating it by a polynomial.



3 More terms, better fit

The more terms you keep, the more closely the polynomial hugs the real function.



4 Why it matters

Polynomials are easy to add, differentiate, and integrate, so replacing a hard function with its series makes calculations far simpler – calculators use this idea.

Watch out: a Taylor approximation is most accurate **near the point** it is built around. Far from that point, you need more terms to keep it accurate.

Practice

Try these in order. The methods are all above.

2.1 State what a power series is. [2]

2.2 State what a Taylor (or Maclaurin) series does. [2]

2.3 State what happens to the approximation as you keep more terms. [1]

2.4 Explain why replacing a function with its power series is useful. [2]

2.5 State where a Taylor approximation is most accurate. [1]