Fundamental Theorem of Calculus

(a) $\int_a^b f'(x)\,dx = f(b) - f(a)$

(b) $\left(\int_a^x g(t)\,dt\right)' = g(x)$

Isaac Newton found these formulas in an effort to extend the formula $D = RT$ to the case of instantaneous rates.

The Method of Quadrature

- Applies to equations like $y' = 2x$
- Uses the fundamental Theorem of calculus
- only produces a **candidate** solution — it does not verify the solution.

Example Solve by the method of Quadrat

$$y'' = 2x$$

Solution:

$\int y'\,dx = \int 2x\,dx$ — Integrate both sides on x.

$y(x) + C_1 = x^2 + C_2$ — Apply fund. Thm. Calc.

$y(x) = x^2 + C$ — Collect constants.

Candidate found.