Using initial conditions to find C

ex 1 → $f(x) = 5x^2$

Determine the antiderivative.

$F(x) = \frac{5x^3}{3} + C$ ← general solution

Suppose we are given $F(9) = 10$

Use $F(9) = 10$ to find C (9, 10)

$F(9) = \frac{5(9)^3}{3} + C$

$10 = \frac{5(9)^3}{3} + C$

$10 = 1215 + C$

$C = -1205$ $\quad F(x) = \frac{5x^3}{3} - 1205$

rule

$f(x) = cx^n$

$F(x) = \frac{c(x)^{(n+1)}}{(n+1)} + C$

ex 2 → $f(x) = \cos(x)$

$F(\frac{\pi}{2}) = 3$

The initial condition is $F(\frac{\pi}{2}) = 3$

$F(x) = \sin x + C$

Find C:

$F(\frac{\pi}{2}) = \sin(\frac{\pi}{2}) + C$

$3 = 1 + C$

$C = 2$ $\quad F(x) = \sin x + 2$

Antiderivative notation

Antideriv: $\int f(x)\,dx$

ex 3 → $\int x^5\,dx = \frac{x^6}{6} + C$

We will use the term integration to refer to finding the antiderivative

Integral means "total"