

Using initial conditions to find C

ex 1 $\rightarrow f(x) = 5x^2$

Determine the antiderivative.

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

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

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

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

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

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

$$10 = 1215 + C$$

$$C = -1205$$

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

ex 2 $\rightarrow f(x) = \cos(x)$

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

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

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

Find C:

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

$$3 = 1 + C$$

$$C = 2$$

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

Antiderivative notation

Antiderv: $\int f(x) dx$

ex 3 $\rightarrow \int x^6 dx = \frac{x^7}{7} + C$

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

Integral means "total"