

Section 25.4: The Definite Integral

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11:02 AM

definite integral:

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

note: where did the +C go?
it canceled!

examples:

$$\begin{aligned}\int_1^5 3x^2 dx &= x^3 \Big|_1^5 \\ &= 5^3 - 1^3 \\ &= 124\end{aligned}$$

note: $\int 3x^2 dx = x^3 + C$

let's practice, mixing definite & indefinite integrals:

$$\begin{aligned}\int_4^9 (p^{3/2} - 3) dp &= \frac{2}{5} p^{5/2} - 3p \Big|_4^9 \\ &= \left(\frac{2}{5} \cdot 9^{5/2} - 27 \right) - \left(\frac{2}{5} \cdot 4^{5/2} - 12 \right) \\ &= \frac{2}{5} 243 - \frac{2}{5} 32 - 15 \\ &= \underline{37} - 69.4\end{aligned}$$

$$= \frac{347}{5} = 69.4$$

$$\begin{aligned}\int \frac{1 + 4x\sqrt{x}}{x\sqrt{x}} dx &= \int \left(\frac{1}{x\sqrt{x}} + 4 \right) dx \\ &= \int \left(x^{-3/2} + 4 \right) dx \\ &= \frac{x^{-1/2}}{-1/2} + 4x + C \\ &= -2x^{-1/2} + 4x + C\end{aligned}$$