Section 25.4: The Definite Integral

definite integral:

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

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

examples:

$$\int_1^5 3x^2\, dx = x^3 \Big|_1^5$$

$$= 5^3 - 1^3$$
$$= 124$$

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

Let's practice, mixing definite & indefinite integrals:

$$\int_4^9 (\rho^{3/2} - 3)\, d\rho = \frac{2}{5}\rho^{5/2} - 3\rho \Big|_4^9$$

$$= \left(\frac{2}{5} \cdot 9^{5/2} - 27\right) - \left(\frac{2}{5} 4^{5/2} - 12\right)$$

$$= \frac{2}{5} 243 - \frac{2}{5} 32 - 15$$

$$= \underline{347} \ldots 69.4$$

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

$$\int \frac{1 + 4x\sqrt{x}}{x\sqrt{x}} \, dx = \int \left(\frac{1}{x\sqrt{x}} + 4 \right) dx$$

$$= \int \left(x^{-3/2} + 4 \right) dx$$

$$= \frac{x^{-1/2}}{-1/2} + 4x + C$$

$$= -2x^{-1/2} + 4x + C$$