Fundamental theorem of calculus flashcard

Basic forms	**Superficially-modified forms**
Provided that the integrand is continuous on $[a, b]$, integration corresponds to anti-differentiation $$\int_a^b \frac{\mathrm{d}f}{\mathrm{d}x}\,\mathrm{d}x = f(b) - f(a)$$ Note $$\frac{\mathrm{d}f}{\mathrm{d}x} = f'(x)$$	Total change theorem Provided that the integrand is continuous on $[a, b]$, $$f(b) = f(a) + \int_a^b \frac{\mathrm{d}f}{\mathrm{d}x}\,\mathrm{d}x$$
Provided that the integrand is continuous on $[a, b]$ and that $x \in [a, b]$, the derivative undoes any *precisely* corresponding integral $$\frac{\mathrm{d}}{\mathrm{d}x}\int_a^x f(t)\,\mathrm{d}t = f(x)$$	Provided that the integrand is continuous on $[a, b]$, that $u(x) \in [a, b]$, and that u is differentiable with respect to x, differentiation removes integration (keeping chain-rule in mind) $$\frac{\mathrm{d}}{\mathrm{d}x}\int_a^{u(x)} f(t)\,\mathrm{d}t = \underbrace{\left(\frac{\mathrm{d}}{\mathrm{d}u(x)}\int_a^{u(x)} f(t)\,\mathrm{d}t\right)}_{f(u(x))} \cdot \frac{\mathrm{d}u(x)}{\mathrm{d}x}$$