Integration and areas

Review 14. How the integral $\int_a^b f(x)\,\mathrm{d}x$ is constructed from sums $\sum f(x)\Delta x$ (where we are summing over rectangles of width Δx between a and b; roughly at position x their height is roughly $f(x)$). [Σ is a capital sigma, and just means "sum". Don't worry about it for now. We will see it again later.]

Example 15. $\displaystyle\int_0^{\pi} \sin(x)\,\mathrm{d}x =$

Why is $\displaystyle\int_0^{2\pi} \sin(x)\,\mathrm{d}x = 0$? Explain geometrically in terms of areas.

Substitution

Example 16. $\displaystyle\int x e^{x^2}\,\mathrm{d}x =$

(We substitute $u = x^2$ so that $\frac{\mathrm{d}u}{\mathrm{d}x} = 2x$.)

Example 17. $\displaystyle\int e^{2x}\,\mathrm{d}x =$

Example 18. $\displaystyle\int \sin(3x+1)\,\mathrm{d}x =$

Example 19. $\displaystyle\int \sqrt{5x-1}\,\mathrm{d}x =$

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