Fundamental Theorem of Calculus (5.4)

If $F(x)$ is any antiderivative of $f(x)$, then

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

This theorem allows us to easily calculate definite integrals when area arguments are hard to use.

Calculate $\int_0^{\pi} \sin(x)\,dx$.

Calculate $\int_{\ln(2)}^{\ln(5)} 2e^x\,dx$.

Calculate $\int_2^3 -5t^2 - 2t + 1\, dt$.

Calculate $\int_{-\pi/2}^{\pi/2} \cos(x)\, dx$.

Calculate $\int_{-\pi}^{\pi} \sin(x)\,dx$.

Calculate $\int_{-1}^{2} \cosh(x)\,dx + \int_{2}^{5} \cosh(x)\,dx$.

Calculate $\int_0^1 \frac{1}{1+x^2} - x^2\,dx$.

Calculate $\int_e^{e^3} \frac{1}{x}\,dx$.

Calculate $\int_{e^3}^e \frac{1}{x}\,dx$.

Suppose $a(t) = t^{-2}$ m/sec^2, $v(1) = 5$ m/sec, and $s(1) = 10$. What is $s(t)$?

Suppose $s''(t) = a(t) = -10$ m/sec^2, $s'(0) = v(0) = 4$ m/sec, and $s(0) = 100$. What are $v(t)$ and $s(t)$?