

Fundamental Theorem of Calculus II

1. True False $\int_a^x f(u)du$ gives you a general form of an antiderivative (including the $+C$).
2. True False Let $F(x) = \int_0^x f(u)du$. Then $G(x)$ be another antiderivative of $f(x)$. For all x we have $F(x) = G(x) - G(0)$.
3. True False Let $f(x)$ be a continuous function on the interval $[a, b]$, and let $F(x) = \int_a^x f(u)du$. Then $F(x)$ is defined on the interval $[a, b]$.
4. True False Let $f(x)$ be a continuous function on the interval $[a, b]$, and let $F(x) = \int_a^x f(u)du$. Then $F'(x) = f(x)$ on the interval $[a, b]$.
5. If $\int_1^x f(u)du = \frac{1}{x} + a$, find f, a .

Σ -notation

Examples

6. Write out $\sum_{r=1}^n (-1)^r r$.
7. Write out $\sum_{r=1}^{\infty} (-1)^r r$.
8. Write $1 + 3 + 5 + \cdots + (2n + 1)$ in Σ notation.

Problems

9. Write out $\sum_{k=1}^{2n} \frac{1}{k}$.
10. Write out $\sum_{a=1}^n f(a)^2$.
11. Convert $\frac{1}{1} - \frac{1}{2} + \frac{1}{3} - \cdots$ into Σ notation.

12. Convert $(f(x) - 1)^2 + (f(x) - 2)^2 + \cdots + (f(x) - 10)^2$ to Σ notation.
13. Convert $-1 + 4 - 9 + \cdots - 121$ into Σ notation.
14. Write $1 + 2 + 4 + 8 + \cdots + 2^{2^n}$ in Σ notation.

Substitution Rule

Example

15. Find $\int x e^{x^2} dx$.
16. Find $\int_0^{16} \sqrt{4 - \sqrt{x}} dx$.

Problems

17. Find $\int \frac{\ln x}{x} dx$.
18. Find $\int \frac{1}{x \ln x} dx$.
19. Find $\int x \sqrt{1 - x} dx$.
20. Find $\int_0^{\sqrt{\pi}} x \cos(x^2) dx$.
21. Find $\int \sin(x) \sec^2(x) dx$.
22. Find $\int 2x e^{e^{x^2}} e^{x^2} dx$.