

Practice Problem (Not Exhaustive)

①

$$1) \frac{d}{dx} \left(\int_{x^2}^{e^{x^2}} (25t^{15} + t^{-15}) dt \right)$$

Integrate

$$2) \int \frac{dx}{x^2 - 5x + 6}$$

$$3) \int \frac{dx}{x^2 + 5x + 6}$$

$$4) \int \frac{dx}{x^2 + 5x - 6}$$

$$\int \frac{dx}{x^2 - 5x - 6}$$

$$5) \int \frac{x dx}{x^2 + 1}$$

$$6) \int \frac{dx}{x^2 + 2x + 3}$$

$$\int \frac{dx}{\sqrt{2x^2 - 5}}$$

$$7) \int \frac{dx}{\sqrt{2x^2 - 5}}$$

$$8) \int_0^{\pi/2} \sin^{10}(x) \cos^3(x) dx$$

$$9) \int_{\pi/4}^{\pi/3} \cot(x) \operatorname{cosec}^2(x) dx$$

$$10) \text{ Solve } \frac{dy}{dx} = t y \text{ with } y(0) = 1$$

$$11) \int x e^x \sin x dx$$

12) $\int x \ln x \, dx$

13) $\int_{\pi/2}^{100} (1 + \sin x)^{100} \cos(x) \, dx$

13) $\int_0^{100} (1 + \sin(x))^{100} \cos(x) \, dx$

14) $\int \frac{dx}{x^3 - 4x}$

15) Trapezoid Rule. $T(n) = \Delta x \left[\frac{1}{2} f(x_0) + f(x_1) + f(x_2) + \dots + f(x_{n-1}) + \frac{1}{2} f(x_n) \right]$

Error Bound Find k s.t. $|f^{(2)}(x)| \leq k$ on $[a, b]$. then $E_T \leq \frac{k(b-a)^3}{12n^2}$

Find an approximation to $\int_0^1 x^4 \, dx$

by Trapezoid rule so that error is with 10^{-1} .

→ Do not compute the integral.

16) Does $\int_0^{\infty} x e^{-x^2} \, dx$ converge? 17) Does $\int_0^1 \frac{1}{x^2} \, dx$ converge?

18) Does $\int_0^1 \frac{1}{x} \, dx$ converge?

If so find the values.