Standard Integrals & Integral Test Worksheet

MTH 202A - Fall 2022 - University of Portland

Instructions: Provide complete solutions for each problem. Show steps clearly and write your solutions with standard mathematical notations.

Goals:

- To review how to integrate functions using the standard integral guide.
- To apply the basic integration by substitution.
- To put together the integral test and evaluating improper integrals.

Part I: Integration Review

(1) Evaluate the following integrals:

a. $\int \frac{1}{x\sqrt{x}} \quad dx$

b. $\int 2\cos(x) + \frac{4}{\sqrt{4-x^2}} \quad dx$

(2) Evaluate the following definite integrals:

a. $\int_{-\pi}^{\pi} \sin(x) + \cos(x) \quad dx$

b. $\int_{2}^{e} \frac{2}{x-1} + \frac{3}{x} \quad dx$

(3) For the following integrals, identify the type of improper integral, evaluate it, and determine whether the integral converges or diverges:

a. $\int_{-\infty}^{0} \frac{1}{x^2+9} \quad dx$

b. $\int_{-1}^{1} \frac{1}{x^3} \quad dx$

Part II: Basic Integration by Substitution

(4) Use basic substitution to evaluate the following integrals:

a. $\int 2x(x^2+1)^4 \ dx$

b. $\int \frac{x}{x^2+1} \ dx$

Part III: Integral Test

(5) Use the integral test to determine whether the following series converge or diverge:

a. $\sum_{n=1}^{\infty} \frac{1}{(n+1)^2}$

b. $\sum_{n=0}^{\infty} \frac{4n}{2n^2+3}$