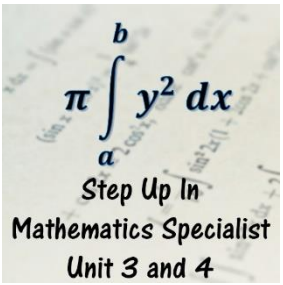
4.2 Integration and Quotients

Problems Worksheet



1. Given that $\int \frac{1}{x} dx = \ln x$ for $x > 0$, demonstrate that $\int \frac{1}{x} dx = \ln|x| + c$ for $\{x \in \mathbb{R}: x \neq 0\}$.

2. Determine the following integrals and simplify where possible.

   a. $\int \frac{6x-2}{3x^2-2x+19} dx$

   b. $\int \frac{4-x^2}{x^3-12x+11} dx$

   c. $\int \frac{24x}{x^2+5} dx$

   d. $\int \frac{e^x}{2-5e^x} dx$

3. Determine the following integrals and simplify where possible.

a. $\int \frac{x^3+1}{x+2}\,dx$

b. $\int \frac{x^4-x^3}{x^2-1}\,dx$

4. Determine the following indefinite integrals.

a. $\int \frac{3x+9}{(x-2)(x-1)}\,dx$

b. $\int \frac{3-x^2}{(x+4)^3}\,dx$

c. $\int \frac{x+3}{x^3-x^2}\,dx$

d. $\int \frac{x^2+9}{(x-3)(x+1)^2}\,dx$

5. Evaluate the following definite integrals exactly.

a. $\int_3^4 \frac{3x-1}{x^2+x-6}\,dx$

b. $\int_{-1}^4 \frac{1-2x}{(x+3)^2}\,dx$

6. Determine the value of k which satisfies the following definite integral: $\int_0^k \frac{2x-1}{x^2-5x+6}\,dx = \ln\frac{256}{243}$.