

Trigonometric Integrals and Partial Fractions

1. (a) Evaluate the following indefinite integrals:

$$\int \sin^3(x) dx$$

- (b) Use the answer to the previous part to compute the following definite integrals:

i. $\int_0^\pi \sin^3(x) dx$

ii. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^3(x) dx$

- (c) Is there an easier way to compute $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin^3(x) dx$?

2. Evaluate the following indefinite integrals:

(a) $\int \sin^2(x) \cos^2(x) dx$

(b) $\int \sin^4(x) \cos^3(x) dx$

(c) $\int \sin(5x) \cos(6x) dx$

3. Evaluate the following indefinite integrals:

(a) $\int \frac{1}{3x+1} dx$

(b) $\int \frac{2x}{x-1} dx$

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

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

$$(e) \int \frac{1}{x^2 - 1} dx$$

$$(f) \int \frac{x^2}{x^2 - 1} dx$$

$$(g) \int \frac{1}{x^2 + 2x - 3} dx$$

$$(h) \int \frac{5x - 4}{2x^2 + x - 1} dx$$

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

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

$$(k) \int \frac{1}{x^2 + 9} dx$$