

Guided Work Series Number 4

1

On Limited Expansions & Integrals

Exercise 3.1 (Limited Expansions)

Find the limited expansions of the following functions up to the specified order:

1. $f(x) = e^x \cos x$ up to order 3 around $x = 0$
2. $g(x) = \ln(1 + \sin x)$ up to order 4 around $x = 0$
3. $h(x) = \sqrt{1+x}$ up to order 3 around $x = 0$

Exercise 3.2 (Integration by Substitution)

Evaluate the following integrals using substitution:

1. $\int_0^{\pi/2} \sin^2(x) \cos(x) dx$
2. $\int \frac{2x}{x^2 + 1} dx$
3. $\int x e^{x^2} dx$

Exercise 3.3 (Integration by Parts)

Evaluate the following integrals using integration by parts:

1. $\int x e^{-x} dx$
2. $\int x \ln x dx$
3. $\int x^2 e^x dx$

Exercise 3.4 (Area Between Curves)

Find the area between the given curves:

1. $y = x^2$ and $y = x + 2$
2. $y = \sqrt{x}$ and $y = x^2$ from $x = 0$ to $x = 1$
3. $y = \cos x$ and $y = \sin x$ from $x = 0$ to $x = \frac{\pi}{4}$

Exercise 3.5 (Definite Integrals with Absolute Value)

Evaluate the following definite integrals:

1. $\int_{-1}^2 |x| dx$
2. $\int_0^{2\pi} |\sin x| dx$
3. $\int_{-2}^3 |x^2 - 1| dx$

Exercise 3.6 (Mixed Techniques)

Evaluate the following integrals using appropriate methods:

1. $\int e^{\sqrt{x}} dx$
2. $\int \frac{\ln x}{x} dx$
3. $\int x^2 \sin x dx$