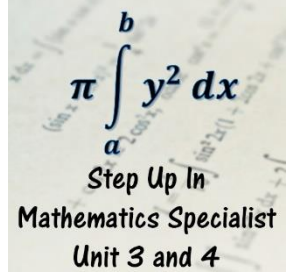


4.5 Integration by Parts

Problems Worksheet



NOTE: Integration by parts is beyond the scope of Mathematics: Specialist Unit 4. These problems are provided as extension work into integration only.

1. Integrate the following using the technique of Integration by Parts.

a. $\int x \sin x dx$

b. $\int x \cos 3x dx$

c. $\int x^2 \sin x dx$

d. $\int x^3 \cos 2x dx$

2. Integrate the following using the technique of Integration by Parts.

a. $\int e^x \sin x \, dx$

b. $\int \ln x \, dx$

c. $\int \ln x^2 \, dx$

d. $\int x^2 \ln x \, dx$

3. Integrate the following using the technique of Integration by Parts. Simplify your answers fully.

a. $\int x\sqrt{x+1} dx$

b. $\int \sin 2\theta \cos 3\theta d\theta$

c. $\int (\ln x)^2 dx$

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

4. Evaluate the following integrals using the technique of Integration by Parts.

a. $\int_0^{\frac{\pi}{4}} x \sin x \, dx$

b. $\int_0^{\pi} e^x \cos x \, dx$

5.

- a. Show that $n \int \sin^n x \, dx = (n - 1) \int \sin^{n-2} x \, dx - \sin^{n-1} x \cos x$.
Hint: Consider $\sin^n x = \sin x \sin^{n-1} x$

- b. Hence demonstrate $\int_0^{\frac{\pi}{2}} \sin^5 x \, dx = \frac{8}{15}$.