

**Exercise 5. Integration of  $\sin^2 x$ ,  $\cos^2 x$ ,  $\tan^2 x$  and  $\cot^2 x$**

In Problems 1 to 4, integrate with respect to the variable.

1.  $\sin^2 2x$

2.  $3 \cos^2 t$

3.  $5 \tan^2 3\theta$

4.  $2 \cot^2 2t$

In Problems 5 to 8, evaluate the definite integrals, correct to 4 significant figures.

5.  $\int_0^{\pi/3} 3 \sin^2 3x \, dx$

6.  $\int_0^{\pi/4} \cos^2 4x \, dx$

7.  $\int_0^{0.5} 2 \tan^2 2t \, dt$

8.  $\int_{\pi/6}^{\pi/3} \cot^2 \theta \, d\theta$

### Exercise 6. Integration of powers of sines and cosines

Integrate the following with respect to the variable:

1.  $\sin^3 \theta$

2.  $2 \cos^3 2x$

3.  $2 \sin^3 t \cos^2 t$

4.  $\sin^3 x \cos^4 x$

5.  $2 \sin^4 2\theta$

### Exercise 6. Integration of products of sines and cosines

In Problems 1 to 4, integrate with respect to the variable.

1.  $\sin 5t \cos 2t$

2.  $2 \sin 3x \sin x$

3.  $3 \cos 6x \cos x$

4.  $\frac{1}{2} \cos 4\theta \sin 2\theta$

In Problems 5 to 8, evaluate the definite integrals.

5.  $\int_0^{\pi/2} \cos 4x \cos 3x \, dx$

6.  $\int_0^1 2 \sin 7t \cos 3t \, dt$

7.  $-4 \int_0^{\pi/3} \sin 5\theta \sin 2\theta \, d\theta$

8.  $\int_1^2 3 \cos 8t \sin 3t \, dt$

**Exercise 7. integration using the sine  $\theta$  substitution**

1. Determine:  $\frac{5}{\sqrt{4-t^2}} dt$

2. Determine:  $\int \frac{3}{\sqrt{9-x^2}} dx$

3. Determine:  $\int \sqrt{4-x^2} dx$

4. Determine:  $\int \sqrt{16-9t^2} dt$

5. Evaluate:  $\int_0^4 \frac{1}{\sqrt{16-x^2}} dx$

**Exercise 8. Integration using the  $\tan\theta$  substitution**

1. Determine:  $\int \frac{3}{4+t^2} dt$

2. Determine:  $\int \frac{5}{16+9\theta^2} d\theta$

3. Evaluate:  $\int_0^1 \frac{3}{1+t^2} dt$

4. Evaluate:  $\int_0^3 \frac{5}{4+x^2} dx$