

# Questions: Definite integration

Donald Campbell

## Summary

A selection of questions for the study guide on definite integration.

*Before attempting these questions, it is highly recommended that you read [Guide: Definite integration].*

## Q1

Evaluate the following definite integrals with respect  $x$ .

1.1.  $\int_1^4 2 \, dx$

1.2.  $\int_{-2}^2 3x \, dx$

1.3.  $\int_{-2}^1 (3 - 5x) \, dx$

1.4.  $\int_2^4 2x^3 \, dx$

1.5.  $\int_0^2 (4x^2 - 3x + 1) \, dx$

1.6.  $\int_{-3}^{-1} (6x^4 + 1) \, dx$

1.7.  $\int_{-2}^2 (x - 2)(2x + 1) \, dx$

1.8.  $\int_0^3 x^2 (3x - 2) \, dx$

## Q2

Evaluate the following definite integrals with respect to  $x$ , using the power rule and the chain rule (or an appropriate substitution  $u = ax + b$ ).

2.1.  $\int_1^{27} \frac{4}{\sqrt[3]{x}} \, dx$

$$2.2. \int_1^4 (2\sqrt{x} + x^2) \, dx$$

$$2.3. \int_1^4 (x^{3/2} - x^{-1/2}) \, dx$$

$$2.4. \int_0^3 (2x^3 - 7x + 5) \, dx$$

$$2.5. \int_1^4 (6x^{-2} - 2x^{1/2}) \, dx$$

$$2.6. \int_0^1 (2x + 1)^3 \, dx$$

$$2.7. \int_{-1}^1 (4 - 3x)^2 \, dx$$

$$2.8. \int_0^2 (1 + x)^3 \, dx$$

$$2.9. \int_1^4 \left(\frac{x}{2} - 3\right)^2 \, dx$$

$$2.10. \int_{-1}^1 (2x + 3)^2 \, dx$$

### Q3

Evaluate the following trigonometric definite integrals with respect to  $x$ , using the graphs of  $\sin(ax)$  and  $\cos(bx)$  to help you.

$$3.1. \int_0^{\pi/2} \sin(x) \, dx$$

$$3.2. \int_0^{\pi} \cos(x) \, dx$$

$$3.3. \int_{\pi/2}^{\pi} \sin(x) \, dx$$

$$3.4. \int_{\pi}^{2\pi} \sin(x) \, dx$$

$$3.5. \int_0^{3\pi/2} \sin(x) \, dx$$

$$3.6. \int_0^{\pi/4} \sin(2x) \, dx$$

$$3.7. \int_0^{\pi} \sin(2x) \, dx$$

$$3.8. \int_{\pi/4}^{3\pi/2} \cos(2x) \, dx$$

$$3.9. \int_{\pi/4}^{\pi/2} \cos(2x) \, dx$$

$$3.10. \int_0^{4\pi} \cos\left(\frac{x}{2}\right) \, dx$$

## Q4

Evaluate the following trigonometric definite integrals with respect to  $x$ , using the graphs of  $\sin(ax)$  and  $\cos(bx)$  to help you.

$$4.1. \int_0^{\pi/6} \cos(2x) \, dx$$

$$4.2. \int_{-\pi/4}^0 \sin(3x) \, dx$$

$$4.3. \int_0^{\pi/3} (\sin(x) + \cos(x)) \, dx$$

$$4.4. \int_{\pi/6}^{\pi/2} \cos\left(4x - \frac{\pi}{3}\right) \, dx$$

$$4.5. \int_{-\pi/6}^{\pi/6} \sin(x) \, dx$$

$$4.6. \int_0^{\pi/2} \cos\left(2x + \frac{\pi}{6}\right) \, dx$$

$$4.7. \int_{-\pi/3}^{\pi/3} \sin(5x) \, dx$$

$$4.8. \int_{\pi/6}^{\pi/4} (\cos(x) - \sin(x)) \, dx$$

$$4.9. \int_0^{\pi/4} \cos(6x) \, dx$$

$$4.10. \int_{-\pi/6}^{\pi/6} \sin\left(3x - \frac{\pi}{4}\right) \, dx$$

[After attempting the questions above, please click this link to find the answers.](#)

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## **Version history and licensing**

v1.0: initial version created 05/25 by Donald Campbell as part of a University of St Andrews VIP project.

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