

# Answers: Introduction to integration

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## Summary

Answers to questions relating to the guide on introduction to integration.

These are the answers to [Questions: Introduction to integration](#).

**Please attempt the questions before reading these answers!**

### Q1

$$1.1. \quad \int x^4 \, dx = \frac{1}{5}x^5 + C.$$

$$1.2. \quad \int 2x \, dx = x^2 + C.$$

$$1.3. \quad \int 7x^5 \, dx = \frac{7}{6}x^6 + C.$$

$$1.5. \quad \int -5 \, dt = -5t + C.$$

### Q2

$$2.1. \quad \int \frac{3}{y^3} \, dy = -\frac{3}{2}y^{-2} + C.$$

$$2.2. \quad \int 6x^{-4} \, dx = -2x^{-3} + C.$$

$$2.3. \quad \int -\frac{2}{x^5} \, dx = \frac{1}{2}x^{-4} + C.$$

$$2.4. \quad \int \frac{8}{3x^6} \, dx = -\frac{8}{15}x^{-5} + C.$$

$$2.5. \quad \int -\frac{7}{2z^7} \, dz = \frac{7}{12}z^{-6} + C.$$

### Q3

$$3.1. \quad \int x^{1/3} \, dx = \frac{3}{4}x^{4/3} + C.$$

$$3.2. \quad \int 3t^{-2/3} \, dt = 9t^{1/3} + C.$$

$$3.3. \quad \int \frac{4x^{1/4}}{3} dx = \frac{16}{15}x^{5/4} + C.$$

$$3.4. \quad \int \frac{2}{5x^{1/3}} dx = \frac{3}{5}x^{2/3} + C.$$

$$3.5. \quad \int \frac{5}{6y^{-4/3}} dy = \frac{5}{14}y^{7/3} + C.$$

## Q5

$$5. \quad \int e^{2x} dx = \frac{1}{2}e^{2x} + C$$

$$6. \quad \int -3e^{-3x} dx = e^{-3x} + C$$

$$7. \quad \int 2e^{11x} dx = \frac{2}{11}e^{11x} + C$$

$$8. \quad \int \frac{4}{x} dx = 4 \ln |x| + C$$

$$9. \quad \int -\frac{5}{3x} dx = -\frac{5}{3} \ln |x| + C$$

$$5.1. \quad \int \cos(x) dx = \sin(x) + C.$$

$$5.2. \quad \int \sin(2x) dx = -\frac{1}{2} \cos(2x) + C.$$

$$5.3. \quad \int \frac{5}{6} \cos(x) dx = \frac{5}{6} \sin(x) + C.$$

$$5.4. \quad \int \cos(3x) dx = \frac{1}{3} \sin(3x) + C.$$

$$5.5. \quad \int \sin\left(\frac{x}{3}\right) dx = -3 \cos\left(\frac{x}{3}\right) + C.$$

## Answers

### Q1

$$1.1. \quad \int_1^4 2 dx = 6$$

$$1.2. \quad \int_{-2}^2 3x dx = 0$$

$$1.4. \quad \int_2^4 2x^3 dx = 120$$

**Q2**

2.1.  $\int_1^{27} \frac{4}{\sqrt[3]{x}} dx = 48$

**Q3**

3.  $\int_0^{\ln(3)} 4e^x dx = 8$

4.  $\int_0^5 e^{-3x} dx = \frac{1}{3}(1 - e^{-15})$

5.  $\int_1^2 -4e^{4x} dx = e^4(1 - e^4)$

6.  $\int_1^2 \frac{2}{x} dx = 2 \ln(2)$

7.  $\int_1^{e^3} -\frac{4}{x} dx = -12$

8.  $\int_{e^3}^{e^9} \frac{9}{5x} dx = \frac{54}{5}$

3.1.  $\int_0^{\pi/2} \sin(x) dx = 1$

3.2.  $\int_0^{\pi} \cos(x) dx = 0$

3.6.  $\int_0^{\pi/4} \sin(2x) dx = \frac{1}{2}$

**Q4**

4.1.  $\int_0^{\pi/6} \cos(2x) dx = \frac{\sqrt{3}}{4}$

4.2.  $\int_{-\pi/4}^0 \sin(3x) dx = -\frac{1}{3} - \frac{1}{3\sqrt{2}}$

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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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