Answers: Introduction to integration

Donald Campbell

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. $\displaystyle\int x^4 \,\mathrm{d}x = \frac{1}{5}x^5 + C.$

1.2. $\displaystyle\int 2x \,\mathrm{d}x = x^2 + C.$

1.3. $\displaystyle\int 7x^5 \,\mathrm{d}x = \frac{7}{6}x^6 + C.$

1.4. $\displaystyle\int -5 \,\mathrm{d}t = -5t + C.$

1.5. $\displaystyle\int \frac{3}{y^3} \,\mathrm{d}y = -\frac{3}{2}y^{-2} + C.$

1.6. $\displaystyle\int 6x^{-4} \,\mathrm{d}x = -2x^{-3} + C.$

1.7. $\displaystyle\int -\frac{2}{x^5} \,\mathrm{d}x = \frac{1}{2}x^{-4} + C.$

1.8. $\displaystyle\int \frac{8}{3x^6} \,\mathrm{d}x = -\frac{8}{15}x^{-5} + C.$

1.9. $\displaystyle\int -\frac{7}{2z^7} \,\mathrm{d}z = \frac{7}{12}z^{-6} + C.$

1.10. $\displaystyle\int x^{1/3} \,\mathrm{d}x = \frac{3}{4}x^{4/3} + C.$

1.11. $\displaystyle\int 3t^{-2/3} \,\mathrm{d}t = 9t^{1/3} + C.$

1.12. $\displaystyle\int \frac{4x^{1/4}}{3} \,\mathrm{d}x = \frac{16}{15}x^{5/4} + C.$

1.13. $\displaystyle\int \frac{2}{5x^{1/3}} \,\mathrm{d}x = \frac{3}{5}x^{2/3} + C.$

1.14. $\displaystyle\int \frac{5}{6y^{-4/3}}\,\mathrm{d}y = \frac{5}{14}y^{7/3} + C.$

Q5

2.1. $\displaystyle\int e^{2x}\,\mathrm{d}x = \frac{1}{2}e^{2x} + C$

2.2. $\displaystyle\int -3e^{-3x}\,\mathrm{d}x = e^{-3x} + C$

2.3. $\displaystyle\int 2e^{11x}\,\mathrm{d}x = \frac{2}{11}e^{11x} + C$

2.4. $\displaystyle\int \frac{4}{x}\,\mathrm{d}x = 4\ln|x| + C$

2.5. $\displaystyle\int -\frac{5}{3x}\,\mathrm{d}x = -\frac{5}{3}\ln|x| + C$

2.6. $\displaystyle\int \cos(x)\,\mathrm{d}x = \sin(x) + C.$

2.7. $\displaystyle\int \sin(2x)\,\mathrm{d}x = -\frac{1}{2}\cos(2x) + C.$

2.8. $\displaystyle\int \frac{5}{6}\cos(x)\,\mathrm{d}x = \frac{5}{6}\sin(x) + C.$

2.9. $\displaystyle\int \cos(3x)\,\mathrm{d}x = \frac{1}{3}\sin(3x) + C.$

2.10. $\displaystyle\int \sin\left(\frac{x}{3}\right)\,\mathrm{d}x = -3\cos\left(\frac{x}{3}\right) + C.$

Q3

3.1. $\displaystyle\int_1^4 2\,\mathrm{d}x = 6$

3.2. $\displaystyle\int_{-2}^2 3x\,\mathrm{d}x = 0$

3.3. $\displaystyle\int_2^4 2x^3\,\mathrm{d}x = 120$

3.4. $\displaystyle\int_1^{27} \frac{4}{\sqrt[3]{x}}\,\mathrm{d}x = 48$

3.5. $\displaystyle\int_0^{\ln(3)} 4e^x\,\mathrm{d}x = 8$

3.6. $\displaystyle\int_0^5 e^{-3x}\,\mathrm{d}x = \frac{1}{3}\left(1 - e^{-15}\right)$

3.7. $\displaystyle\int_1^2 -4e^{4x}\,\mathrm{d}x = e^4(1-e^4)$

3.8. $\displaystyle\int_1^2 \frac{2}{x}\,\mathrm{d}x = 2\ln(2)$

3.9. $\displaystyle\int_1^{e^3} -\frac{4}{x}\,\mathrm{d}x = -12$

3.10. $\displaystyle\int_{e^3}^{e^9} \frac{9}{5x}\,\mathrm{d}x = \frac{54}{5}$

3.11. $\displaystyle\int_0^{\pi/2} \sin(x)\,\mathrm{d}x = 1$

3.12. $\displaystyle\int_0^{\pi} \cos(x)\,\mathrm{d}x = 0$

3.13. $\displaystyle\int_0^{\pi/4} \sin(2x)\,\mathrm{d}x = \frac{1}{2}$

3.14. $\displaystyle\int_0^{\pi/6} \cos(2x)\,\mathrm{d}x = \frac{\sqrt{3}}{4}$

3.15. $\displaystyle\int_{-\pi/4}^{0} \sin(3x)\,\mathrm{d}x = -\frac{1}{3} - \frac{1}{3\sqrt{2}}$

Version history and licensing

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