# Questions: Introduction to integration

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**Summary**

A selection of questions for the study guide on introduction to integration.

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

## Q1

Use the power rule to integrate the following expressions with respect to $x$.

1.1. $\int x^4 \, \mathrm{d}x$

1.2. $\int 2x \, \mathrm{d}x$

1.3. $\int 7x^5 \, \mathrm{d}x$

1.4. $\int 3x \, \mathrm{d}x$

1.5. $\int -5 \, \mathrm{d}x$

1.6. $\int (2x - 5x^2) \, \mathrm{d}x$

1.7. $\int (4x^2 + 2) \, \mathrm{d}x$

1.8. $\int (10x^{-2} - 2x) \, \mathrm{d}x$

1.9. $\int (3x^8 + 4x^{-4} - 2x) \, \mathrm{d}x$

1.10. $\int (5x - 2x^{-3} - 3x^4) \, \mathrm{d}x$

## Q2

Use the power rule to integrate the following expressions with respect to $x$, using the laws of indices where necessary.

2.1. $\int \frac{3}{x^3}\,\mathrm{d}x$

2.2. $\int \frac{6}{x^4}\,\mathrm{d}x$

2.3. $\int -\frac{2}{x^5}\,\mathrm{d}x$

2.4. $\int \frac{8}{3x^6}\,\mathrm{d}x$

2.5. $\int -\frac{7}{2x^7}\,\mathrm{d}x$

2.6. $\int \left(\frac{5}{x^4}+\frac{3}{x^5}\right)\,\mathrm{d}x$

2.7. $\int \left(\frac{4}{3x^3}-\frac{6}{5x^7}\right)\,\mathrm{d}x$

2.8. $\int \left(\frac{7}{x^4}+x^3-\frac{2}{x^6}\right)\,\mathrm{d}x$

2.9. $\int \left(\frac{3}{x^5}+\frac{4}{x^6}-1\right)\,\mathrm{d}x$

2.10. $\int \left(\frac{9}{x^9}+\frac{4}{7x^6}-\frac{7}{3x^8}\right)\,\mathrm{d}x$

## Q3

The following expressions contain fractional indices of $x$. Use the power rule to integrate these expressions with respect to $x$, using the laws of indices where necessary.

3.1. $\int x^{1/3}\,\mathrm{d}x$

3.2. $\int 3x^{-2/3}\,\mathrm{d}x$

3.3. $\int \frac{4x^{1/4}}{3}\,\mathrm{d}x$

3.4. $\int \frac{2}{5x^{1/3}}\,\mathrm{d}x$

3.5. $\int \frac{5}{6x^{-4/3}}\,\mathrm{d}x$

3.6. $\int 2\sqrt[3]{x}\,\mathrm{d}x$

3.7. $\int \frac{6}{\sqrt[4]{x}}\,\mathrm{d}x$

3.8. $\int \left(x^3-\frac{3}{4\sqrt[3]{x}}+\sqrt[4]{x}\right)\,\mathrm{d}x$

3.9. $\displaystyle\int \left(\sqrt[5]{x} - \frac{4}{\sqrt[3]{x}}\right) \mathrm{d}x$

3.10. $\displaystyle\int \sqrt[4]{x^5}\, \mathrm{d}x$

3.11. $\displaystyle\int x(2 - \sqrt[3]{x})\, \mathrm{d}x$

3.12. $\displaystyle\int \frac{x}{3}\left(\sqrt{x^4} - 2x^{1/3}\right)\, \mathrm{d}x$

3.13. $\displaystyle\int \frac{5}{\sqrt[3]{x}}(3x^2 + 2)^2\, \mathrm{d}x$

3.14. $\displaystyle\int (3x^2 + 4x)(x^3 + 1)^2\, \mathrm{d}x$

3.15. $\displaystyle\int \frac{2}{\sqrt[4]{x}}(2x^2 + 3)^2\, \mathrm{d}x$

## Q4

Integrate the following expressions with respect to $x$ by simplifying the fractions first.

4.1. $\displaystyle\int \frac{x^3 - 2x}{x}\, \mathrm{d}x$

4.2. $\displaystyle\int \frac{x^4 - 3x}{x^3}\, \mathrm{d}x$

4.3. $\displaystyle\int \frac{x^2 - 1}{\sqrt{x}}\, \mathrm{d}x$

4.4. $\displaystyle\int \frac{x^3 + 5x}{\sqrt[3]{x}}\, \mathrm{d}x$

4.5. $\displaystyle\int \frac{(x^2 - 1)(2x^3 - 3)}{x^2}\, \mathrm{d}x$

4.6. $\displaystyle\int \frac{4(3x - 1)^2}{x^5}\, \mathrm{d}x$

4.7. $\displaystyle\int \frac{5 - 8x^2}{x\sqrt{x}}\, \mathrm{d}x$

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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.