Integration (powers of x) 4ii

A Level

Part A Cubic

Find $\int (x^3 + 8x - 5)\,\mathrm{d}x$.

The following symbols may be useful: `c, x`

Part B Square root

Find $\int 12\sqrt{x}\,\mathrm{d}x$.

The following symbols may be useful: `c, x`

Used with permission from UCLES, A Level Maths, January 2009, OCR C2, Question 1

Indefinite Integrals 1

A Level Further A

Find the following indefinite integrals.

Part A Integrate $(3x-1)(x+1)$

Find $\int (3x-1)(x+1)\mathrm{d}x$.

The following symbols may be useful: `k, x`

Part B Integrate $(\sqrt{p}-\frac{1}{p})^2$

Find $\int \left(\sqrt{p}-\frac{1}{p}\right)^2 \mathrm{d}p$.

The following symbols may be useful: `k, p`

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Gameboard:

STEM SMART Single Maths 12 - Introducing Integration

Physics. You work it out.

Indefinite Integrals 2

A Level Further A

Find the following indefinite integrals.

Part A Integrate $\frac{q^2+3}{q^{\frac{5}{2}}}$

Find $\int \frac{q^2+3}{q^{\frac{5}{2}}} \mathrm{d}q$.

The following symbols may be useful: `k, q`

Part B Integrate $2z(z^2-1)(z^2+1)$

Find $\int 2z(z^2-1)(z^2+1)\mathrm{d}z$.

The following symbols may be useful: `k, z`

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Integrating Powers 1

A Level Further A

Part A Integrate $4x^3$

Find the indefinite integral of $4x^3$.

The following symbols may be useful: `k, x`

Part B Integrate αx.

Find $\int_0^{x_0} \alpha x \, \mathrm{d}x$, where α is a constant.

The following symbols may be useful: `alpha, x, x_0`

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Integrating Powers 2

A Level Further A

Part A Integrate ax^{-8}

Find the indefinite integral of ax^{-8}, where a is a constant.

The following symbols may be useful: `a, k, x`

Part B Integrate $\frac{4}{x^2}$

Find $\int_1^2 \frac{4}{x^2}\mathrm{d}x$.

The following symbols may be useful: `k, x`

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Integration (powers of x) 1ii

A Level

Part A Find integral

Find $\int(2x+1)(x+3)\mathrm{d}x$

The following symbols may be useful: `c, x`

Part B Evaluate integral

Evaluate $\int_0^9 \frac{1}{\sqrt{x}}\mathrm{d}x$.

Used with permission from UCLES, A Level Maths, June 2005, OCR C2, Question 3

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Definite Integrals 3

A Level Further A

For the integrals given below, find the values of a and m respectively.

Part A $\int_{-1}^{a} x^{-\frac{4}{5}}\mathrm{d}x = 10$

Given that the definite integral $\int_{-1}^{a} x^{-\frac{4}{5}}\mathrm{d}x = 10$, find the value of a.

The following symbols may be useful: `a`

Part B $\int_{0}^{4} \frac{m+1}{2}x^{m}\mathrm{d}x = 4$

Given that the integral $\int_{0}^{4} \frac{m+1}{2}x^{m}\mathrm{d}x = 4$, find the value of m.

The following symbols may be useful: `m`

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Definite Integrals 2

A Level Further A

Find the following integrals.

Part A $\int_1^\infty \frac{3}{2x\sqrt{x}}\mathrm{d}x$

Find $\displaystyle\int_1^\infty \frac{3}{2x\sqrt{x}}\mathrm{d}x$.

Part B $\int_{-8}^0 \frac{1}{\sqrt[3]{x}}\mathrm{d}x$

Find $\displaystyle\int_{-8}^0 \frac{1}{\sqrt[3]{x}}\mathrm{d}x$.

Part C $\int_{-1}^1 (1+x+\frac{x^2}{2}+\frac{x^3}{6})\mathrm{d}x$

Find $\displaystyle\int_{-1}^1 \left(1+x+\frac{x^2}{2}+\frac{x^3}{6}\right)\mathrm{d}x$. Give your answer as an improper fraction.

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Physics. You work it out.

Integrating Powers 4

A Level Further A

C C C C C C

Part A Integrate $\frac{A}{r^7} - \frac{B}{r^{13}}$

Find $\int_a^\infty \left(\frac{A}{r^7} - \frac{B}{r^{13}}\right) \mathrm{d}r$.

(The force between, for example, two atoms of an inert gas, a distance r apart is given by $\left(\frac{A}{r^7} - \frac{B}{r^{13}}\right)$, where A and B are (negative) constants; the first term is the attractive force between them (the van der Waals interaction, due to their fluctuating induced dipoles) and the second is the repulsive force due to the overlap of their electron shells. The integral describes the potential energy of such a system i.e. the work done bringing one atom from infinity to within a distance a of the other atom.)

Find $\int_a^\infty \left(\frac{A}{r^7} - \frac{B}{r^{13}}\right) \mathrm{d}r$.

The following symbols may be useful: `A, B, a`

Part B Integrate $\frac{C}{x^2} + D$

Find $\int_{x_1}^{x_2} \left(\frac{C}{x^2} + D\right) \mathrm{d}x$.

(The function $\left(\frac{C}{x^2} + D\right)$, where C and D are constants, could describe the component of an electric field in the x-direction due to a combination of the field due to a point charge at the origin and a uniform field in the x-direction. The integral is then the potential difference between two points x_1 and x_2 on the x-axis.)

Find $\int_{x_1}^{x_2} \left(\frac{C}{x^2} + D\right) \mathrm{d}x$.

The following symbols may be useful: `C, D, x_1, x_2`

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