*You can use **Partial Fractions** to integrate*

In Section 2 (pages 14-15), you saw how to **break down** a scary-looking **algebraic fraction** into **partial fractions**. This comes in pretty handy when you're **integrating —** you could try other methods, but it would get **messy** and probably **end in tears**. Fortunately, once you've split it up into **partial fractions**, it's much **easier** to integrate.

Example: Find $\int \frac{12x+6}{4x^2-9}\,dx$.

This is the example from p.14, and it can be written as partial fractions like this: $\frac{2}{2x+3}+\frac{4}{2x-3}$

Be careful with the coefficients here. Try differentiating them to see where they come from if you're not sure.

Integrating the partial fractions is much easier: $\int\left(\frac{2}{2x+3}+\frac{4}{2x-3}\right)dx = \ln|2x+3| + 2\ln|2x-3| + C$

$= \ln|(2x+3)(2x-3)^2| + C$

This answer's been simplified using the log laws (see p.76).

Practice Questions

Q1 Find: a) $\int 4e^{2x}\,dx$, b) $\int e^{3x-5}\,dx$, c) $\int \frac{2}{3x}\,dx$, d) $\int \frac{2}{2x+1}\,dx$.

Q2 Integrate $\int \frac{20x^4+12x^2-12}{x^5+x^3-3x}\,dx$.

Q3 $\frac{3x+10}{(2x+3)(x-4)} \equiv \frac{A}{2x+3}+\frac{B}{x-4}$. Find the value of A and B, and hence find $\int \frac{3x+10}{(2x+3)(x-4)}\,dx$.

Exam Questions

Q1 Find $\int 3e^{(5-6x)}\,dx$. [2 marks]

Q2 Given that $x = 1$ is a root of $x^3-6x^2+11x-6$, completely factorise $x^3-6x^2+11x-6$, and hence find $\int \frac{4x-10}{x^3-6x^2+11x-6}\,dx$. [8 marks]

Don't cheat in your exams — copying's derivative, so revising's integral...

There's quite a lot of different techniques to take in on these pages. Don't forget to try differentiating your answer at the end, so you know if it's gone wrong somewhere — checking my answers has saved my skin more times than I can tell you (28). Make sure you're a master of partial fractions before you even think about integrating them.