Integrals leading to Exponentials and Logs

Notes

1. **(Review of last lesson)** Find $\displaystyle\int_2^{2.5} \frac{1}{(4x-7)^2}dx$.

2. Using the method of "Let $u = \ldots$", find (a) $\displaystyle\int e^{2x+1}dx$ (b) $\displaystyle\int \frac{1}{2x+1}dx$.

3. Find $\displaystyle\int ke^{ax+b}dx$.

Notes

Integrating e^{ax+b} and $\dfrac{1}{ax+b}$ is similar to integrating $(ax+b)^n$.

In general:
$$\int ke^{ax+b}dx = \frac{k}{a}e^{ax+b} + c$$
$$\int \frac{k}{ax+b}dx = \frac{k}{a}\ln(ax+b) + c$$

N.B. Always differentiate back to check your answer.
The function in the bracket must be linear.
Similarly to integrations involving brackets, you can reach the answer by inspection i.e.
without showing the "Let $u = \ldots$" working.

E.g. 1 Find: (a) $\displaystyle\int e^{8x+1}dx$ (b) $\displaystyle\int \frac{1}{6x-5}dx$

  Working: (a) $\dfrac{1}{8}e^{8x+1} + c$

E.g. 2 Find: (a) $\displaystyle\int \frac{1}{e^{5x+3}}dx$ (b) $\displaystyle\int_2^3 e^{2x}dx$

E.g. 3 Express $\displaystyle\int_b^a \frac{15}{5+3x}dx$ as a single logarithm.

E.g. 4 The graph of the curve $y = f(x)$ passes through $(1, 2)$. Find $f(x)$ if $f'(x) = \dfrac{4}{10-9x}$.

E.g. 5 Given that $\displaystyle\int_1^A \frac{4}{6x-5}dx = 10$ and $A \geq 1$, find A in terms of e.

Exercise
p222 11A Qu 2i, 3i

Summary

$$\int k(ax + b)^n dx = \frac{k}{a(n + 1)}(ax + b)^{n+1} + c$$

$$\int ke^{ax+b} dx = \frac{k}{a}e^{ax+b} + c$$

$$\int \frac{k}{ax + b}dx = \frac{k}{a}\ln(ax + b) + c$$