

STEP III, 2010 Q8

- 8 Given that $P(x) = Q(x)R'(x) - Q'(x)R(x)$, write down an expression for

$$\int \frac{P(x)}{(Q(x))^2} dx.$$

- (i) By choosing the function $R(x)$ to be of the form $a + bx + cx^2$, find

$$\int \frac{5x^2 - 4x - 3}{(1 + 2x + 3x^2)^2} dx.$$

Show that the choice of $R(x)$ is not unique and, by comparing the two functions $R(x)$ corresponding to two different values of a , explain how the different choices are related.

- (ii) Find the general solution of

$$(1 + \cos x + 2 \sin x) \frac{dy}{dx} + (\sin x - 2 \cos x)y = 5 - 3 \cos x + 4 \sin x.$$



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