Edexcel C4 January 2012

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(c) Using the substitution $u = 1 + \cos x$, or otherwise, show that

$$\int \frac{2\sin 2x}{(1+\cos x)}\,\mathrm{d}x = 4\ln(1+\cos x) - 4\cos x + k$$

where k is a constant.

(5)

$$u = 1 + \cos x \Rightarrow \frac{du}{dx} = -\sin x$$

$$\int \frac{2\sin 2x}{u}\frac{du}{-\sin x}$$

$$= \int \frac{4\sin x\cos x}{u}\,\frac{du}{-\sin x}$$

$$= \int \frac{-4\cos x}{u}\,du$$

$$= \int -\frac{4(u-1)}{u}\,du$$

$$= \int -4 + \frac{4}{u}\,du$$

$$= -4u + 4\ln u + C$$

$$= -4(1+\cos x) + 4\ \ln(1+\cos x) + C$$

$$= -4\cos x\ + 4\ln(1+\cos x) + k$$

$$(k = C - 4)$$