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**2014 13a** (i) Differentiate  $3 + \sin 2x$ .

**1**

(ii) Hence, or otherwise, find  $\int \frac{\cos 2x}{3 + \sin 2x} dx$ .

**2**

(i)  $\frac{d}{dx}[3 + \sin 2x] = 2 \cos 2x$

(ii)  $\int \frac{\cos 2x}{3 + \sin 2x} dx = \frac{1}{2} \int \frac{2 \cos 2x}{3 + \sin 2x} dx$

$$= \frac{1}{2} \log_e(3 + \sin 2x) + c \quad (\text{using result in part (i)})$$

State Mean:

**0.73****1.19**

\* These solutions have been provided by [projectmaths](#) and are not supplied or endorsed by BOSTES.

### Board of Studies: Notes from the Marking Centre

(i) Most candidates completed this part, correctly recognising that  $2 \cos 2x$  is the derivative of  $\sin 2x$ .

Common problems were:

- incorrectly adjusting the constant multiplier using  $\frac{1}{2}$  or  $-2$ ;
- misinterpreting the question and differentiating using the product rule  $uv' + vu'$  with  $u = 3$  and  $v = \sin 2x$ ;
- attempting to integrate instead of differentiating;
- making errors when transcribing from line to line, for example  $\sin 2x$  changing to  $\sin x$ .

(ii) In successful responses, candidates recognised that they were working with a log function, and showed the required adjustment to the numerator, linking their response from (i).

Common problems were:

- not recognising that the integral was in the form  $\frac{f'(x)}{f(x)}$  and the primitive was a logarithmic function;
- incorrect value of constant multiplier;
- incorrect use of brackets or no brackets at all;
- using the quotient rule and differentiating.

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