

| Question | Scheme   | Marks | AOs  |
|----------|--|-------|------|
| 4        | <p><b>Examples:</b></p> $4 \sin \frac{\theta}{2} \approx 4 \left( \frac{\theta}{2} \right), \quad 3 \cos^2 \theta \approx 3 \left( 1 - \frac{\theta^2}{2} \right)^2$ $3 \cos^2 \theta = 3(1 - \sin^2 \theta) \approx 3(1 - \theta^2)$ $3 \cos^2 \theta = 3 \frac{(\cos 2\theta + 1)}{2} \approx \frac{3}{2} \left( 1 - \frac{4\theta^2}{2} + 1 \right)$  | M1    | 1.1a |
|          | <p><b>Examples:</b></p> $4 \sin \frac{\theta}{2} + 3 \cos^2 \theta \approx 4 \left( \frac{\theta}{2} \right) + 3 \left( 1 - \frac{\theta^2}{2} \right)^2$ $4 \sin \frac{\theta}{2} + 3 \cos^2 \theta = 4 \left( \frac{\theta}{2} \right) + 3(1 - \sin^2 \theta) \approx 2\theta + 3(1 - \theta^2)$ $4 \sin \frac{\theta}{2} + 3 \cos^2 \theta = 4 \sin \frac{\theta}{2} + 3 \frac{(\cos 2\theta + 1)}{2} \approx 4 \left( \frac{\theta}{2} \right) + \frac{3}{2} \left( 1 - \frac{4\theta^2}{2} + 1 \right)$ | dM1   | 1.1b |
|          | $= 2\theta + 3(1 - \theta^2 + \dots) = 3 + 2\theta - 3\theta^2$  | A1    | 2.1  |
|          |  | (3)   |      |

(3 marks)

### Notes

M1: Attempts to use at least one correct approximation **within the given expression**.

Either  $\sin \frac{\theta}{2} \approx \frac{\theta}{2}$  or  $\cos \theta \approx 1 - \frac{\theta^2}{2}$  or e.g.  $\sin \theta \approx \theta$  if they write  $\cos^2 \theta$  as  $1 - \sin^2 \theta$  or e.g.

$\cos 2\theta \approx 1 - \frac{(2\theta)^2}{2}$  (condone missing brackets) if they write  $\cos^2 \theta$  as  $\frac{1 + \cos 2\theta}{2}$ .

Allow sign slips only with any identities used but the appropriate approximations must be applied.

dM1: Attempts to use correct approximations **with the given expression** to obtain an expression in terms of  $\theta$  only. **Depends on the first method mark.**

A1: Correct terms following correct work. Allow the terms in any order and ignore any extra terms if given correct or incorrect.