

9

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

Using the above identities

(a) show that  $\cos 2\theta = 2 \cos^2 \theta - 1$  (3)

(b) find a simplified expression for  $\sin 2\theta$  in terms of  $\sin \theta$  and  $\cos \theta$  (1)

(c) show that  $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$  (4)

Hence, or otherwise,

(d) solve, for  $0 \leq \theta < \pi$  giving your answers in terms of  $\pi$ , the equation

$$6 \cos \theta - 8 \cos^3 \theta + 1 = 0$$
 (4)

(e) find

(i)  $\int (8 \cos^3 \theta + 4 \sin \theta) d\theta$

(ii) the exact value of  $\int_0^{\frac{\pi}{3}} (8 \cos^3 \theta + 4 \sin \theta) d\theta$  (4)

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**Question 9 continued**

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**(Total for Question 9 is 16 marks)**

