

- 9 (a) Expand  $(1-8x^2)^{\frac{1}{2}}$  in ascending powers of  $x$ , up to and including the term in  $x^6$  giving each coefficient as an integer. (3)

$$g(x) = \frac{a+bx}{\sqrt{1-8x^2}} \quad \text{where } a \text{ and } b \text{ are prime numbers}$$

Given that the fourth and fifth terms, in ascending powers of  $x$ , in the series expansion of  $g(x)$  are  $20x^3$  and  $48x^4$  respectively,

- (b) find the value of  $a$  and the value of  $b$  (4)

Using the first five terms, in ascending powers of  $x$ , in the series expansion of  $g(x)$

- (c) obtain an estimate, to 4 significant figures, of  $\int_0^{0.2} g(x) \, dx$  (4)

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**Question 9 continued**

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10 (a) Using formulae on page 2, show that

(i)  $\sin 2A = 2 \sin A \cos A$

(ii)  $\cos 2A = 2 \cos^2 A - 1$

(3)

$$f(\theta) = \frac{2 \tan \theta}{1 + \tan^2 \theta}$$

(b) Show that  $f(\theta) = \sin 2\theta$

(4)

(c) Solve, in radians to 3 significant figures, for  $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ , the equation

$$5 \tan \left( x + \frac{\pi}{6} \right) = \left[ 1 + \tan^2 \left( x + \frac{\pi}{6} \right) \right] \left[ 1 - 2 \cos^2 \left( x + \frac{\pi}{6} \right) \right]$$

(6)

(d) Using calculus, find the exact value of

$$\int_0^{\frac{\pi}{2}} \left( \frac{4 \tan \theta}{1 + \tan^2 \theta} - \cos 5\theta + 2 \right) d\theta$$

(4)

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**Question 10 continued**

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