9 (a) Expand $\left(1-8x^2\right)^{-\frac{1}{2}}$ in ascending powers of x, up to and including the term in x^6

giving each coefficient as an integer.

(3)

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

Question 9 continued

Question 9 continued

Question 9 continued

(Total for Question 9 is 11 marks)

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)

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

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

(4)

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

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

(4)

Question 10 continued

Question 10 continued

Question 10 continued

(Total for Question 10 is 17 marks)