7. (a) Use De Moivre's theorem to

(i) show that

$$\sin 5\theta \equiv 5\cos^4\theta\sin\theta - 10\cos^2\theta\sin^3\theta + \sin^5\theta$$

(ii) determine an expression for $\cos 5\theta$ in terms of $\sin\theta$ and $\cos\theta$

(4)

(b) Hence show that, for $\cos 5\theta \neq 0$

$$\tan 5\theta \equiv \frac{5\tan\theta - 10\tan^3\theta + \tan^5\theta}{1 - 10\tan^2\theta + 5\tan^4\theta}$$

(2)

(c) Using the result of part (b) and showing all stages of your working, determine the solutions of the equation

$$2x^5 - 15x^4 - 20x^3 + 30x^2 + 10x - 3 = 0$$

giving your answers to 3 decimal places.

(5)

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Question 7 continued

(Total for Question 7 is 11 marks)