



DeMoivre's Theorem and Applications To Trigonometry Exam Questions (Edexcel)

Q1.

$$z = -2 + (2\sqrt{3})i$$

(a) Find the modulus and the argument of z .

(3)

Using de Moivre's theorem,

(b) find z^6 , simplifying your answer,

(2)

(c) find the values of w such that $w^4 = z^3$, giving your answers in the form $a + ib$, where $a, b \in \mathbb{R}$

(4)

(Total for question = 9 marks)
(Q08 6668/01, June 2015)

Q2.

(a) Express the complex number $-2 + (2\sqrt{3})i$ in the form $r(\cos \theta + i \sin \theta)$, $-\pi < \theta \leq \pi$.

(3)

(b) Solve the equation

$$z^4 = -2 + (2\sqrt{3})i$$

giving the roots in the form $r(\cos \theta + i \sin \theta)$, $-\pi < \theta \leq \pi$.

(5)

(Total 8 marks)

(Q09 6668/01, June 2012)

Q3.

(a) Use de Moivre's theorem to show that

$$\cos 6\theta = 32\cos^6\theta - 48\cos^4\theta + 18\cos^2\theta - 1$$

(5)

(b) Hence solve for $0 \leq \theta \leq \frac{\pi}{2}$

$$64\cos^6\theta - 96\cos^4\theta + 36\cos^2\theta - 3 = 0$$

giving your answers as exact multiples of π .

(5)

(Total 10 marks)

(Q11 6668/01, June 2014)



Q4.

(a) Use de Moivre's theorem to prove that

$$\sin 7\theta = 7 \sin \theta - 56 \sin^3 \theta + 112 \sin^5 \theta - 64 \sin^7 \theta \quad (5)$$

(b) Hence find the distinct roots of the equation

$$1 + 7x - 56x^3 + 112x^5 - 64x^7 = 0 \quad (5)$$

giving your answer to 3 decimal places where appropriate.

(Total for question = 10 marks)

(Q04 9FM0/02, Oct 2020)

Q5.

(a) Use de Moivre's theorem to show that

$$\cos^6 \theta = 32 \cos^6 \theta - 48 \cos^4 \theta + 18 \cos^2 \theta - 1 \quad (5)$$

(b) Hence solve for $0 \leq \theta \leq \frac{\pi}{2}$

$$64 \cos^6 \theta - 96 \cos^4 \theta + 36 \cos^2 \theta - 3 = 0$$

giving your answers as exact multiples of π .

(5)

(Total 10 marks)

(Q11 6668/01, June 2014)

Q6.

The complex number $z = e^{i\theta}$, where θ is real.

(a) Use de Moivre's theorem to show that

$$z^n + \frac{1}{z^n} = 2 \cos n\theta$$

where n is a positive integer.

(2)

(b) Show that

$$\cos^5 \theta = \frac{1}{16} (\cos 5\theta + 5 \cos 3\theta + 10 \cos \theta) \quad (5)$$

(c) Hence find all the solutions of

$$\cos 5\theta + 5 \cos 3\theta + 12 \cos \theta = 0$$

in the interval $0 \leq \theta < 2\pi$

(4)

(Total 11 marks)



Q7.

(a) Use de Moivre's theorem to show that

$$\sin^5 \theta \equiv a \sin 5\theta + b \sin 3\theta + c \sin \theta$$

where a , b and c are constants to be found.

(5)

(b) Hence show that $\int_0^{\frac{\pi}{3}} \sin^5 \theta \, d\theta = \frac{53}{480}$

(5)

(Total for question = 10 marks)

(Q11 6668/01, June 2016)

Q8.

(a) Use de Moivre's theorem to show that

$$\sin 5\theta = 16 \sin^5 \theta - 20 \sin^3 \theta + 5 \sin \theta$$

(5)

Hence, given also that $\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$,

(b) find all the solutions of

$$\sin 5\theta = 5 \sin 3\theta,$$

in the interval $0 \leq \theta < 2\pi$. Give your answers to 3 decimal places.

(6)

(Total 11 marks)

(Q11 6668/01, June 2011)