ASIGNMENT FOR COMPLEX NUMBERS

QUESTION 1

a) Given $w = 2i - 2$ and $v = \dfrac{\sqrt{3}}{2} + \dfrac{1}{2}i$. Express $w^2 + \dfrac{2}{v}$ in the form $a + ib$.

Hence, calculate the modulus and argument of $w^2 + \dfrac{2}{v}$.   (5 marks)

b) Given the complex number $z = 1 + i\sqrt{3}$.

    i. Express z in polar form.   (2 marks)

    ii. Obtain all possible complex values of $w = z^{\frac{1}{5}}$ and sketch them on an Argand diagram.   (6 marks)

c) Using De Moivre's Theorem, show that

$$\sin(3\theta) = 3\sin\theta - 4\sin^3\theta.$$

Hence, obtain all possible roots for the equation $8x^3 - 6x + 3 = 1$.

(7 marks)

QUESTION 2

(a) Given a complex number $u = 2 + 3i$.

    (i) Determine $z = u^2 + 13 - 4i$ in the form $a + ib$.   (2 marks)

   (ii) Express z in polar form.   (2 marks)

  (iii) Solve $w^3 = z$ and sketch the roots on a single Argand Diagram.

                                                                     (4 marks)

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

$$\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta.$$

Hence, obtain all solutions of x for the following equation:

$$4x^3 - 3x + 1 = 0.$$

                                                                   (7 marks)