

PreCalc BC Vectors and Complex Review

Name:

1. Find ALL the roots of the equation: $x^8 - x^6 + x^2 - 1 = 0$

- a) Determine total number of roots, real and non-real (F.T.A.).
- b) List possible rational roots.
- c) Use grouping or synthetic division to factor out rational roots.
- d) Use DeMoivre's thm. to find remaining complex roots (in $a + bi$ form).

2. Consider the set: $\left\{ 1, \left(\frac{1}{2} + \frac{\sqrt{3}}{2}i \right), \left(-\frac{1}{2} + \frac{\sqrt{3}}{2}i \right), \left(-\frac{1}{2} - \frac{\sqrt{3}}{2}i \right), \left(\frac{1}{2} - \frac{\sqrt{3}}{2}i \right) \right\}$

- a) Rewrite the set in CIS form.
- b) Graph this set.
- c) Find the smallest possible positive integer, n , such that each of these raised to the n 'th power is equal to a positive real number.
- d) What is that number, ie. the real number?
- e) Find at least one more n 'th root of that number.

3. Solve COMPLETELY: $iz^2 + 3z + 10 = 0$ (in $a + bi$ form)

4. Let $z = 1 - i\sqrt{3}$.

a) Find each of the following in rectangular and CIS form (*no calculator !!*):

i. z^2 ii. $\frac{1}{z}$ iii. \bar{z} iv. z^5 v. \sqrt{z}

b) Make a graph that shows z and each of $i - v$

5. A ship endeavoring to travel due west encounters a strong current flowing 36° south of west at 8 mph. What bearing should the captain set if she wishes to maintain her westerly progress while the engines are set at 25 mph?

6. $\vec{v} = \langle 8, -6 \rangle$ and $\vec{u} = \langle 9, k \rangle$

a) Find k if the two vectors are orthogonal (perpendicular).

b) Find a unit vector in the same direction as \vec{v}

7. Use dot product to find the measure of $\angle PQR$, with $P(-3, 8)$; $Q(1, 2)$; $R(9, 1)$.

8. Find the three cube roots of -1.

9. Given $\vec{A} = \langle 18, 0^\circ \rangle$ and $\vec{B} = \langle 10, -40^\circ \rangle$, find \vec{C} (*in magnitude/direction form*) such that

$$\vec{A} + \vec{C} = \vec{B}$$