Delta

Q.1 a Solve the Equation $x^3 = 1$.

Ans Here $x^3 = 1$

$\Rightarrow x^3 - 1 = 0$

$\Rightarrow (x-1)(x^2+x+1) = 0$

giving $x = 1$ or $x^2+x+1 = 0$

if $x^2+x+1=0$, we have in the usual way

$$x = \frac{1}{2}(-1 \pm \sqrt{-3})$$

$$= \frac{1}{2}(-1 \pm i\sqrt{3})$$

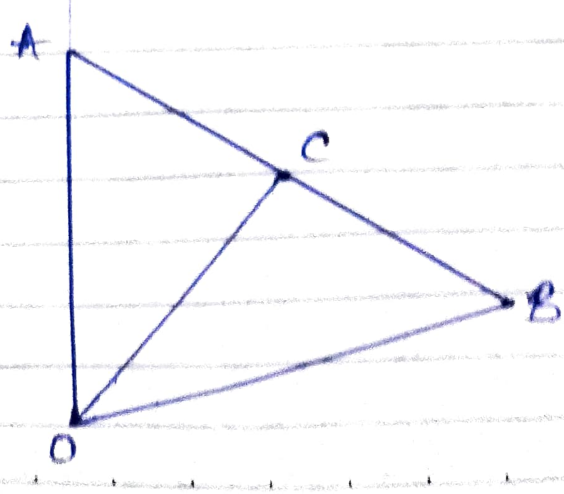
Hence the number $1, \frac{1}{2}(-1 \pm i\sqrt{3})$ are called the three cube roots of unity.

Q2 If a, b are complex number, prove geometrically that $|a+b|^2 + |a-b|^2 = 2|a|^2 + 2|b|^2$

Ans Let A, B be the point which represent a, b. Biseet AB at C, then

$$\overline{OA} + \overline{OB} = 2\overline{OC}$$

and $\overline{OA} - \overline{OB} = \overline{BA} = 2\overline{CA}$



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Therefore $a+b$ and $a-b$ are represented by $\overline{2OC}$ and $\overline{2CA}$; hence

$|a+b| = 2OC, \; |a-b| = 2CA$

Now since C is the mid point of base AB.

$OA^2 + OB^2 = 2OC^2 + 2CA^2$

$\therefore \; 2|a|^2 + 2|b|^2 = |a+b|^2 + |a-b|^2$