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B014
CSE-B

Tutorial 1

Q1) $\dfrac{(3+i)(1-i2)}{1+i}$

Let $z = \dfrac{3(1-i2)+i(1-i2)}{1+i}$

$= \dfrac{3-i6+i-i^2 2}{1+i}$

$= \dfrac{3-i5-(-1)2}{1+i} = \dfrac{3-i5+2}{1+i}$

$= \dfrac{5-i5}{1+i} \times \dfrac{1-i}{1-i}$

$= \dfrac{5(1-i)(1-i)}{1-i^2} = \dfrac{5(1-2i+i^2)}{1-(-1)}$

$= \dfrac{5(1-2i-1)}{2}$

$= \dfrac{5-10i-5}{2} = \dfrac{-10i}{2} = -5i$

$z = \boxed{-5i}$

2) $(1+i)^{-3}$

Let $z = \frac{1}{(1+i)^3} = \frac{1}{(1^3+3(1)^2(i)+3(1)(i)^2+i^3)}$

$= \frac{1}{1+i3-3-i}$

$= \frac{1}{-2+i2}$

$= \frac{1}{-2+i2} \times \frac{-2-i2}{-2-i2}$

$= \frac{-2-i2}{(-2)^2-(i2)^2} = \frac{-2(1+i)}{4-i^2 4} = \frac{-\cancel{2}(1+i)}{2\cancel{4}(1-(-1))}$

$= \cancel{(2+i2)}\ -\frac{1+i}{2(2)} = -\frac{1+i}{4}$

$z = \boxed{-\frac{1}{4} - i\frac{1}{4}}$

3)

Let $z =$

3) $\dfrac{(1+i^3)^2}{(3-i)^3}$

let $z = \dfrac{(1+i^3)^2}{(3-i)^3} = \dfrac{(1-i)^2}{(3-i)^3} = \dfrac{1+i^2-2(1)(i)}{3^3-i^3-3(3)(i)(3-i)}$

$= \dfrac{1-1-i2}{27+i-i9(3-i)}$

$= \dfrac{-i2}{27+i-i27+i^2 9}$

$= \dfrac{-i2}{27-i26-9}$

$= \dfrac{-i2}{18-i26} = \dfrac{-i2}{18-i26} \times \dfrac{18+i26}{18+i26}$

$= \dfrac{-i2(18+i26)}{(18)^2-i^2(26)^2}$

$= \dfrac{-i36-i^2 52}{324-(-1)676}$

$= \dfrac{-i36-(-1)52}{324+676}$

$z = \dfrac{52-i36}{1000} = \dfrac{52}{1000} - i\dfrac{36}{1000}$

$\therefore \boxed{z = \dfrac{13}{250} - i\dfrac{9}{250}}$

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4) $\frac{1}{2-i3} + \frac{5-i}{6+i2}$

Let $z_1 = \frac{1}{2-i3} \times \frac{2+i3}{2+i3}$

$= \frac{2+i3}{4-i^2 9}$

$= \frac{2+i3}{4-(-1)9}$

$= \frac{2+i3}{13}$

$z_1 = \frac{2}{13} + i\frac{3}{13}$

Let $z_2 = \frac{5-i}{6+i2} \times \frac{6-i2}{6-i2}$

$= \frac{5(6-i2)-i(6-i2)}{36-i^2 4}$

$= \frac{30-i10-i6+i^2 2}{36-(-1)4}$

$= \frac{30-i16+(-1)2}{36+4}$

$= \frac{30-i16-2}{40}$

$= \frac{28-i16}{40}$

$= \frac{28}{40} - i\frac{16}{40}$

$z_2 = \frac{7}{10} - i\frac{2}{5}$

$\therefore z_1 + z$

$\therefore z_1 + z$

$$\therefore\ z_1 + z_2 = \frac{2}{13} + i\frac{3}{13} + \frac{7}{10} - i\frac{2}{5}$$

$$= \left(\frac{2}{13} + \frac{7}{10}\right) + \left(i\frac{3}{13} - i\frac{2}{5}\right)$$

$$= \left(\frac{2}{13} + \frac{7}{10}\right) + i\left(\frac{3}{13} - \frac{2}{5}\right)$$

$$\therefore\ z_1 + z_2 = \boxed{\frac{111}{130} - i\frac{11}{65}}$$

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5) $\dfrac{4i^8 - 3i^9 + 3}{3i^{11} - 4i^{10} - 2}$

Let $z = \dfrac{4i^8 - 3i^9 + 3}{3i^{11} - 4i^{10} - 2}$

$= \cancel{4i^?}\ \dfrac{4(i^2)^4 - 3(i)(i^2)^4 + 3}{3(i^2)^5(i) - 4(i^2)^5 - 2}$

$= \dfrac{4(-1)^4 - 3(i)(-1)^4 + 3}{3(-1)^5(i) - 4(-1)^5 - 2}$

$= \dfrac{4 - i3 + 3}{-i3 + 4 - 2}$

$= \dfrac{7 - i3}{2 - i3}$

$= \dfrac{7 - i3}{2 - i3} \times \dfrac{2 + i3}{2 + i3}$

$= \dfrac{7(2 + i3) - i3(2 + i3)}{4 - i^2 9}$

$= \dfrac{14 + i21 - i6 - i^2 9}{4 - (-1)9}$

$= \dfrac{14 + i15 - (-1)9}{13}$

$= \dfrac{14 + i15 + 9}{13} = \dfrac{23 + i15}{13}$

$$\boxed{z = \frac{23}{13} + i\,\frac{15}{13}}$$

6) $\dfrac{2i^3 - \ldots}{3i^2 \ldots}$

Let $z = \ldots$

$z = \ldots$

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6) $\dfrac{2i^3 - 3i^7 + 4i^6 + 2}{3i^2 - 4i^5 + 4}$

Let $z = \dfrac{2i^3 - 3i^7 + 4i^6 + 2}{3i^2 - 4i^5 + 4}$

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

$= \dfrac{2(i)(-1) - 3(i)(-1)^3 + 4(-1)^3 + 2}{3(-1) - 4(i)(-1)^2 + 4}$

$= \dfrac{-2i + 3i - 4 + 2}{-3 - 4i + 4}$

$= \dfrac{i-2}{-4i+1} = \dfrac{-2+i}{1-i4} \times \dfrac{1+i4}{1+i4}$

$= \dfrac{-2(1+i4) + i(1+i4)}{1 - i^2 16}$

$= \dfrac{-2 - i8 + i + i^2 4}{1-(-1)16}$

$= \dfrac{-2 - i7 - 4}{17}$

$= \dfrac{-6 - i7}{17}$

$\boxed{z = \dfrac{-6}{17} - i\dfrac{7}{17}}$

Do as directed

7) If $(x+iy)(2-i3) = 4-i$; find x & y

$\therefore \; (x+iy)(2-i3) = (4-i)$

$\therefore \; (x+iy) = \dfrac{(4-i)}{(2-i3)}$

$= \dfrac{(4-i)}{(2-i3)} \times \dfrac{(2+i3)}{(2+i3)}$

$= \dfrac{4(2+i3) - i(2+i3)}{4 - i^2 9}$

$= \dfrac{8 + i12 - i2 - i^2 3}{4 - (-1)9}$

$= \dfrac{8 + i10 - (-1)3}{4+9}$

$= \dfrac{8 + i10 + 3}{13}$

$= \dfrac{11 + i10}{13}$

$x + iy = \dfrac{11}{13} + i\dfrac{10}{13}$

$\therefore \; \boxed{x = \dfrac{11}{13} \; ; \; y = \dfrac{10}{13}}$

8) If (

Let $\therefore$ z =

=

=

=

z

$\therefore$ x +

$\therefore$ x =

8) If $\left(\frac{1-2i}{3}\right)^3 = x + iy$; find x & y

Sol $\therefore$ $z = \left(\frac{1-2i}{3}\right)^3$

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

$= \frac{1^3 - (2i)^3 - 3(1)^2(2i) + 3(1)(2i)^2}{27}$

$= \frac{1 - 8(-i) - 6i + 12i^2}{27}$

$= \frac{1 + i8 - i6 - 12}{27}$

$= \frac{-11 + i2}{27}$

$z = \frac{-11}{27} + i\frac{2}{27}$

$\therefore$ $x + iy = \frac{-11}{27} + i\frac{2}{27}$

$\therefore$ $\boxed{x = \frac{-11}{27} \ ; \ y = \frac{2}{27}}$

9) Find x & y which satisfies the equation
$$(3x-4y) + i(x^2-y^2) = 5$$

Sol^n:- $\therefore$ $3x - 4y = 5$ —— (1)

$x^2 - y^2 = 0$

$(x+y)(x-y) = 0$ —— (2)

If $(x+y) = 0$,

Multiply eq by 4.

$\therefore$ $4x + 4y = 0$ —— (2)

Add (1) & (2),

$$\begin{aligned} 3x - \cancel{4y} &= 5 \\ (+)\ 4x + \cancel{4y} &= 0 \\ \hline 7x &= 5 \end{aligned}$$

$\therefore$ $x = \frac{5}{7}$

put $x = 5/7$ in (1)

$3\left(\frac{5}{7}\right) - 4y = 5$

$\frac{15}{7} - 4y = 5$

$-4y = \frac{5-15}{7}$

$-4y = \frac{35-15}{7}$

$-4y = \frac{20}{7}$

$\therefore$ $y = \frac{-5}{7}$

If $(x-y)=0$,

Multiply eq. by 4.

$4x - 4y = 0$ —— (3)

Sub (3) from (1),

$$\begin{array}{rl} & 3x - \cancel{4y} = 5 \\ (-) & 4x - \cancel{4y} = 0 \\ & (-) \quad (+) \quad (-) \\ \hline & -x = 5 \end{array}$$

$\therefore x = -5$

Put $x = -5$ in (1)

$3(-5) - 4y = 5$

$-15 - 4y = 5$

$-4y = 20$

$y = -5$

$\therefore \boxed{x = \frac{5}{7} \text{ or } -5 \quad ; \quad y = \frac{-5}{7} \text{ or } -5}$

10) Find $z_1 \cdot z_2$ and $\frac{z_1}{z_2}$

where $z_1 = -1 + i\sqrt{3}$

$z_2 = 2 + i\,2\sqrt{3}$

Soln: $z_1 z_2 = (-1+i\sqrt{3})(2+i2\sqrt{3})$

$= -1(2+i2\sqrt{3}) + i\sqrt{3}(2+i2\sqrt{3})$

$= -2 - i2\sqrt{3} + i2\sqrt{3} + i^2 6$

$= -2 + (-1)6$

$= -2 - 6$

$\boxed{z_1 z_2 = -8}$

$\frac{z_1}{z_2} = \frac{-1+i\sqrt{3}}{2+i2\sqrt{3}}$

$= \frac{-1+i\sqrt{3}}{2+i2\sqrt{3}} \times \frac{2-i2\sqrt{3}}{2-i2\sqrt{3}}$

$= \cancel{(-1+i\sqrt{3})}\ \frac{-1(2-i2\sqrt{3}) + i\sqrt{3}(2-i2\sqrt{3})}{4 - i^2 12}$

$= \frac{-2 + i2\sqrt{3} + i2\sqrt{3} - i^2 6}{4 - (-1)12}$

$= \frac{-2 + i4\sqrt{3} - (-1)6}{4+12}$

$= \frac{-2 + i4\sqrt{3} + 6}{16}$

$= \frac{4 + i4\sqrt{3}}{16}$

$= \frac{4}{16} + i\frac{4\sqrt{3}}{16}$

$\boxed{\cancel{\frac{z_1}{z_2} = \frac{2}{5} + i\frac{2\sqrt{3}}{5}}}$ $\boxed{\frac{z_1}{z_2} = \frac{1}{4} + i\frac{\sqrt{3}}{4}}$

11) If =

L.H.S = 6

= 6

=

R.H.S = 2

= (

=

=

=

=

=

∴ L.H.S

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11) If $z = 3 + i\sqrt{5}$; show that $6z = z^2 + 14$

$L.H.S = 6z$

$= 6(3 + i\sqrt{5})$

$= 18 + i6\sqrt{5}$

$R.H.S = z^2 + 14$

$= (3 + i\sqrt{5})^2 + 14$

$= 9 + \cancel{3^2}\ 2(3)(i\sqrt{5}) + (i\sqrt{5})^2 + 14$

$= 9 + i6\sqrt{5} + i^2 5 + 14$

$= 23 + i6\sqrt{5} + (-1)5$

$= 23 - 5 + i6\sqrt{5}$

$= 18 + i6\sqrt{5}$

$\therefore L.H.S = R.H.S$,,

Hence proved.

12) Find the value of z^3+z^2-z+22 if $z = \frac{5}{1-2i}$

$\therefore\ z = \frac{5}{1-2i} \times \frac{1+2i}{1+2i}$

$= \frac{5+10i}{1-4i^2}$

$= \frac{5+i10}{1-(-1)4}$

$= \frac{5+i10}{1+4}$

$= \frac{5+i10}{5} = \frac{\cancel{5}(1+i2)}{\cancel{5}}$

$z = 1+i2$

$\therefore\ z^3 = (1+i2)^3$

$= 1+(i2)^3+3(1)^2(i2)+3(1)(i2)^2$

$= 1+(i)^3 8+i6+(i)^2 12$

$= 1+(i^2)(i)8+i6+(-1)12$

$= 1+(-1)i8+i6-12$

$= -11-i8+i6$

$z^3 = \cancel{-5+i4}\ \ \cancel{-11+i4}\ -11-i2$

$z^2 = (1+i2)^2$

$= 1+2(1)(i2)+(i2)^2$

$= 1+i4+(i)^2 4$

$= 1+i4+(-1)4$

$= 1+i4-4$

$z^2 = -3+i4$

$\therefore\ z^3 + z^2 - z + 22$

$= (-5+i4) + (-3+i4) - (1+i2) + 22$

$= -5 + i4 + -3 + i4 - 1 - i2 + 22$

$= \boxed{13 + i6}$

$\therefore\ z^3 + z^2 - z + 22$

$= (-11 - i2) + (-3 + i4) - (1 + i2) + 22$

$= -11 - i2 - 3 + i4 - 1 - i2 + 22$

$= \boxed{7}$

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13) If $z_1 = 4 - i5$; $z_2 = 3 + i7$
Find $|3z_1 - 2z_2|$ & $|z_1 z_2|$

Soln:

Let $z = 3z_1 - 2z_2$
$= 3(4-i5) - 2(3+i7)$
$= 12 - i15 - 6 - i14$
$z = 6 - i29$
$x = 6$; $y = -29$

$|z| = \sqrt{x^2+y^2}$
$= \sqrt{6^2 + (-29)^2}$
$= \sqrt{36 + 841}$
$|z| = \sqrt{877}$
$\therefore \boxed{|3z_1 - 2z_2| = \sqrt{877}}$

Let $z = z_1 z_2$
$= (4-i5)(3+i7)$
$= 4(3+i7) - i5(3+i7)$
$= 12 + i28 - i15 - i^2 35$
$= 12 + i13 - (-1)35$
$= 12 + i13 + 35$
$z = 47 + i13$

~~$x = -23$; $y = 13$~~
~~$|z| = \sqrt{x^2+y^2}$~~
~~$= \sqrt{(-23)^2 + (13)^2}$~~
~~$= \sqrt{529 + 169}$~~
~~$|z| = \sqrt{698}$~~
~~$|z_1 z_2| = \sqrt{698}$~~

$x = 47$; $y = 13$
$|z| = \sqrt{x^2+y^2}$
$= \sqrt{(47)^2 + (13)^2}$
$= \sqrt{2209 + 169}$
$|z| = \sqrt{2378}$
$\boxed{|z_1 z_2| = \sqrt{2378}}$

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Express following in polar form

14) $z = -2 - i2\sqrt{3}$

$x = -2 \quad ; y = -2\sqrt{3}$

$r = \sqrt{x^2 + y^2}$

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

$= \sqrt{4 + 12}$

$r = \sqrt{16} \qquad r = 4$

$\theta = \tan^{-1}\left(\frac{y}{x}\right)$

$= \tan^{-1} \frac{-2\sqrt{3}}{-2}$

$= \tan^{-1}\sqrt{3}$

$\theta = \frac{\pi}{3}$

$\therefore$ Polar form =

$z = r(\cos\theta + i\sin\theta)$

$= \boxed{4\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)}$

15) $z =$

$x =$

$r =$

$=$

$=$

$=$

$r =$

$\therefore$ Polar

$z =$

$=$

$=$

15) $z = \frac{-1}{2} - i\frac{\sqrt{3}}{2}$

$x = -\frac{1}{2}$; $y = -\frac{\sqrt{3}}{2}$

$r = \sqrt{x^2+y^2}$

$= \sqrt{\left(\frac{-1}{2}\right)^2 + \left(\frac{-\sqrt{3}}{2}\right)^2}$

$= \sqrt{\frac{1}{4} + \frac{3}{4}}$

$= \sqrt{\frac{4}{4}}$

$r = 1$

$\theta = \tan^{-1}\frac{y}{x}$

$= \tan^{-1}\frac{\cancel{-}\frac{\sqrt{3}}{2}}{\cancel{-}\frac{1}{2}}$

$= \tan^{-1}\frac{2\sqrt{3}}{2}$

$= \tan^{-1}\sqrt{3}$

$\theta = \frac{\pi}{3}$

$\therefore$ Polar form,

$z = r(\cos\theta + i\sin\theta)$

$= 1\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

$= \boxed{\cos\frac{\pi}{3} + i\cdot\sin\frac{\pi}{3}}$

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18) $z = \dfrac{(1+i)(2+i)}{3-i}$

$\therefore z = \dfrac{(1+i)(2+i)}{3-i} \times \dfrac{3+i}{3+i}$

$= \dfrac{[1(2+i)+i(2+i)] \times 3+i}{9-i^2}$

$= \dfrac{(2+i+i2+i^2)(3+i)}{9+1}$

$= \dfrac{(2+i3-1)(3+i)}{10}$

$= \dfrac{(1+i3)(3+i)}{10}$

$= \dfrac{1(3+i)+i3(3+i)}{10}$

$= \dfrac{3+i+i9+i^2 3}{10}$

$= \dfrac{3+i10+(-1)3}{10}$

$= \dfrac{3-3+i10}{10}$

$= \dfrac{i10}{10}$

$z = i$

$x = 0 ; y = 1$

$r = \sqrt{x^2+y^2}$

$r = \sqrt{0^2+1^2} = \sqrt{1}$

$r = 1$

$\theta = \tan^{-1}\left(\frac{y}{x}\right)$

$= \tan^{-1}\left(\frac{1}{0}\right) = \tan^{-1}\infty$

$\theta = \frac{\pi}{2}$

$\therefore$ Polar form

$z = r(\cos\theta + i\sin\theta)$

$= 1\left(\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}\right)$

$\therefore \boxed{z = \cos\frac{\pi}{2} + i\sin\frac{\pi}{2}}$

17) $z = \frac{2+i6\sqrt{3}}{5+i\sqrt{3}}$

$\therefore z = \frac{2+i6\sqrt{3}}{5+i\sqrt{3}} \times \frac{5-i\sqrt{3}}{5-i\sqrt{3}}$

$= \frac{2(5-i\sqrt{3})+i6\sqrt{3}(5-i\sqrt{3})}{25-i^2 3}$

$= \frac{10-i2\sqrt{3}+i30\sqrt{3}-i^2 18}{25-(-1)3}$

$= \frac{10+i28\sqrt{3}+18}{28}$

$= \frac{28+i28\sqrt{3}}{28}$

$= \frac{\cancel{28}(1+i\sqrt{3})}{\cancel{28}}$

$z = 1+i\sqrt{3}$

$x = 1 ; y = \sqrt{3}$

$r = \sqrt{x^2+y^2}$

$= \sqrt{1^2+(\sqrt{3})^2}$

$= \sqrt{1+3} = \sqrt{4}$

$r = 2$

$\theta = \tan^{-1}\left(\frac{y}{x}\right)$

$= \tan^{-1}\left(\frac{\sqrt{3}}{1}\right)$

$= \tan^{-1}\sqrt{3}$

$\theta = \frac{\pi}{3}$

$\therefore$ Polar form

$z = r(\cos\theta + i\sin\theta)$

$\boxed{z = 2\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)}$

$\sin\frac{\pi}{2}$

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18) $z = 3\sqrt{2}(-1+i)$
$= -3\sqrt{2} + i\,3\sqrt{2}$

$x = -3\sqrt{2}$; $y = 3\sqrt{2}$

$r = \sqrt{x^2+y^2}$
$= \sqrt{(-3\sqrt{2})^2+(3\sqrt{2})^2}$
$= \cancel{\sqrt{18+18}}$
$= \sqrt{18+18}$
$= \sqrt{36}$
$r = 6$

$\theta = \tan^{-1}\frac{y}{x}$
$= \tan^{-1}\left(\frac{3\sqrt{2}}{-3\sqrt{2}}\right)$
$= \tan^{-1}(-1)$
$\theta = \frac{-\pi}{4}$

$\therefore$ Polar form,
$z = r(\cos\theta + i\sin\theta)$
$= 6\left(\cos\left(-\frac{\pi}{4}\right) + i\sin\left(-\frac{\pi}{4}\right)\right)$

$$\boxed{z = 6\left(\cos\left(\frac{\pi}{4}\right) - i\sin\left(\frac{\pi}{4}\right)\right)}$$

19) If
find

soln:
Let $z =$
$=$
$=$
$=$
$=$
$=$
$=$
$z =$
$\therefore$ $|z| =$
$=$
$=$
$=$
$|z| =$
$|z| =$

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(19) If $z_1 = 1 + i2$; $z_2 = 2 - i3$

find $\left|\frac{z_1}{z_2}\right|$

soln:

Let $z = \frac{z_1}{z_2}$

$= \frac{1+i2}{2-i3}$

$= \frac{1+i2}{2-i3} \times \frac{2+i3}{2+i3}$

$= \frac{1(2+i3) + i2(2+i3)}{4 - i^2 9}$

$= \frac{2 + i3 + i4 + i^2 6}{4 - (-1)9}$

$= \frac{2 + i7 + (-1)6}{4+9}$

$= \frac{-4 + i7}{13}$

$z = -\frac{4}{13} + i\frac{7}{13}$ $\qquad x = \frac{-4}{13}, y = \frac{7}{13}$

$\therefore |z| = \sqrt{x^2 + y^2}$

$= \sqrt{\left(\frac{-4}{13}\right)^2 + \left(\frac{7}{13}\right)^2}$

$= \sqrt{\frac{16 + 49}{169}}$

$= \sqrt{\frac{65}{169}}$

$|z| = \frac{\sqrt{65}}{13}$

$\boxed{\left|\frac{z_1}{z_2}\right| = \frac{\sqrt{65}}{13}}$

~~$|z| = \sqrt{65}\ \frac{2\sqrt{10}}{13}$~~

$\therefore$ ~~$\left|\frac{z_1}{z_2}\right| = \frac{2\sqrt{10}}{13}$~~

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Q20) show that $\frac{\sqrt{3}}{2} + \frac{i}{2}$ is a ~~cude~~ cube root of i

Soln: To prove: $\sqrt[3]{i} = \frac{\sqrt{3}}{2} + \frac{i}{2}$

T.P.T. $i^{1/3} = \frac{\sqrt{3}}{2} + i\frac{1}{2}$

T.P.T cubing on both sides,

$\therefore i = \left(\frac{\sqrt{3}}{2} + i\frac{1}{2}\right)^3$

R.H.S $= \left(\frac{\sqrt{3}}{2} + i\frac{1}{2}\right)^3$

$= \left(\frac{\sqrt{3}}{2}\right)^3 + \left(i\frac{1}{2}\right)^3 + 3\left(\frac{\sqrt{3}}{2}\right)^2\left(i\frac{1}{2}\right) + 3\left(\frac{\sqrt{3}}{2}\right)\left(i\frac{1}{2}\right)^2$

$= \frac{3\sqrt{3}}{8} + i^3\frac{1}{8} + i\frac{9}{8} + i^2\frac{3\sqrt{3}}{8}$

$= \frac{3\sqrt{3}}{8} + (-i)\frac{1}{8} + i\frac{9}{8} + (-1)\frac{3\sqrt{3}}{8}$

$= \cancel{\frac{3\sqrt{3}}{8}} - i\frac{1}{8} + i\frac{9}{8} - \cancel{\frac{3\sqrt{3}}{8}}$

$= i\frac{8}{8}$

$= i1$

$= \boxed{i}$

$=$ L.H.S.,

Hence proved