⇒ 2ab = -8…….. eq.2

⇒ a = $-\frac{4}{b}$

Now, using the value of a in eq.1, we get

⇒ $\left(-\frac{4}{b}\right)^2$ – b^2 = -15

⇒ 16 – b^4 = -15b^2

⇒ b^4 - 15b^2 - 16= 0

Simplify and get the value of b^2 , we get,

⇒ b^2 = 16 or b^2 = -1

As b is real no. so, b^2 = 16

b= 4 or b= -4

Therefore, a= -1 or a= 1

Hence the square root of the complex no. is -1 + 4i and 1 - 4i.

Q. 11. $\sqrt{-11-60i}$

Answer : Let, $(a + ib)^2$ = -11 - 60i

Now using, $(a + b)^2 = a^2 + b^2 + 2ab$

⇒ $a^2 + (bi)^2$ + 2abi = -11 - 60i

Since i^2 = -1

⇒ $a^2 - b^2$ + 2abi = -11 - 60i

Now, separating real and complex parts, we get

⇒ $a^2 - b^2$ = -11………….eq.1

$\Rightarrow$ 2ab = -60…….. eq.2

$\Rightarrow$ a = $-\frac{30}{b}$

Now, using the value of a in eq.1, we get

$\Rightarrow$ $\left(-\frac{30}{b}\right)^2$ – b^2 = -11

$\Rightarrow$ 900 – b^4 = -11b^2

$\Rightarrow$ b^4- 11b^2 - 900= 0

Simplify and get the value of b^2, we get,

$\Rightarrow$ b^2 = 36 or b^2 = -25

as b is real no. so, b^2 = 36

b= 6 or b= -6

Therefore , a= -5 or a= 5

Hence the square root of the complex no. is -5 + 6i and 5 – 6i.

Q. 12. $\sqrt{7-30\sqrt{-2}}$

Answer : Let, $(a + ib)^2 = 7 - 30\sqrt{2}i$

Now using, $(a + b)^2 = a^2 + b^2 + 2ab$

$\Rightarrow$ $a^2 + (bi)^2 + 2abi = 7 - 30\sqrt{2}i$

Since $i^2 = -1$

$\Rightarrow$ $a^2 - b^2 + 2abi = 7 - 30\sqrt{2}i$

Now, separating real and complex parts, we get

$\Rightarrow$ $a^2 - b^2 = 7$ ………….eq.1

⇒ $2ab = 30\sqrt{2}$........ eq.2

⇒ $a = \frac{15\sqrt{2}}{b}$

Now, using the value of a in eq.1, we get

⇒ $\left(\frac{15\sqrt{2}}{b}\right)^2 - b^2 = 7$

⇒ $450 - b^4 = 7b^2$

⇒ $b^4 + 7b^2 - 450 = 0$

Simplify and get the value of b^2 , we get,

⇒ $b^2 = -25$ or $b^2 = 18$

As b is real no. so, $b^2 = 18$

$b = 3\sqrt{2}$ or $b = -3\sqrt{2}$

Therefore , a= 5 or a= - 5

Hence the square root of the complex no. is $5 + 3\sqrt{2}i$ and $-5 - 3\sqrt{2}i$.

Q. 13. $\sqrt{-8i}$

Answer : Let, $(a + ib)^2 = 0 - 8i$

Now using, $(a + b)^2 = a^2 + b^2 + 2ab$

⇒ $a^2 + (bi)^2 + 2abi = 0 - 8i$

Since $i^2 = -1$

⇒ $a^2 - b^2 + 2abi = 0 - 8i$

Now, separating real and complex parts, we get

⇒ $a^2 - b^2 = 0$ …………..eq.1

⇒ $2ab = -8$…….. eq.2

⇒ $a = -\frac{4}{b}$

Now, using the value of a in eq.1, we get

⇒ $\left(-\frac{4}{b}\right)^2 - b^2 = 0$

⇒ $16 - b^4 = 0$

⇒ $b^4 = 16$

Simplify and get the value of b^2, we get,

⇒ $b^2 = -4$ or $b^2 = 4$

As b is real no. so, $b^2 = 4$

b= 2 or b= -2

Therefore , a= -2 or a= 2

Hence the square root of the complex no. is -2 + 2i and 2 - 2i.

Q. 14. $\sqrt{1-i}$

Answer : Let, $(a + ib)^2 = 1 - i$

Now using, $(a + b)^2 = a^2 + b^2 + 2ab$

⇒ $a^2 + (bi)^2 + 2abi = 1 - i$

Since $i^2 = -1$

⇒ $a^2 - b^2 + 2abi = 1 - i$

Now, separating real and complex parts, we get

⇒ $a^2 - b^2 = 1$………….eq.1

⇒ $2ab = -1$…….. eq.2

⇒ a = $-\frac{1}{2b}$

Now, using the value of a in eq.1, we get

⇒ $\left(-\frac{1}{2b}\right)^2 - b^2 = 1$

⇒ $1 - 4b^4 = 4b^2$

⇒ $4b^4 + 4b^2 - 1 = 0$

Simplify and get the value of b^2, we get,

⇒ $b^2 = \frac{-4 \pm \sqrt{32}}{8}$

As b is real no. so, $b^2 = \frac{-4 + 4\sqrt{2}}{8}$

$b^2 = \frac{-1 + \sqrt{2}}{2}$

b= $\sqrt{\frac{-1 + \sqrt{2}}{2}}$ or b= -$\sqrt{\frac{-1 + \sqrt{2}}{2}}$

Therefore , a= -$\sqrt{\frac{1 + \sqrt{2}}{2}}$ or a= $\sqrt{\frac{1 + \sqrt{2}}{2}}$

Hence the square root of the complex no. is $-\sqrt{\frac{1 + \sqrt{2}}{2}} + \sqrt{\frac{-1 + \sqrt{2}}{2}}\,i$ and $\sqrt{\frac{1 + \sqrt{2}}{2}} - \sqrt{\frac{-1 + \sqrt{2}}{2}}\,i$.

Exercise 5G

Q. 1. Evaluate $\frac{1}{i^{78}}$.

Answer : we have, $\frac{1}{i^{78}}$

$= \frac{1}{(i^4)^{19}.i^2}$

We know that, $i^4 = 1$

$\Rightarrow \frac{1}{1^{19}.i^2}$

$\Rightarrow \frac{1}{i^2} = \frac{1}{-1}$

$\Rightarrow \frac{1}{i^{78}} = -1$

Q. 2. Evaluate ($i^{57} + i^{70} + i^{91} + i^{101} + i^{104}$).

Answer : We have, $i^{57} + i^{70} + i^{91} + i^{101} + i^{104}$

$= (i^4)^{14}.i + (i^4)^{17}.i^2 + (i^4)^{22}.i^3 + (i^4)^{25}.i + (i^4)^{26}$

We know that, $i^4 = 1$

$\Rightarrow (1)^{14}.i + (1)^{17}.i^2 + (1)^{22}.i^3 + (1)^{25}.i + (1)^{26}$

$= i + i^2 + i^3 + i + 1$

$= i - 1 - i + i + 1$

$= i$

Q. 3. Evaluate

$$\left(\frac{i^{180} + i^{178} + i^{176} + i^{174} + i^{172}}{i^{170} + i^{168} + i^{166} + i^{164} + i^{162}}\right)$$

Answer :

We have, $\left(\frac{i^{180}+i^{178}+i^{176}+i^{174}+i^{172}}{i^{170}+i^{168}+i^{166}+i^{164}+i^{162}}\right)$

$$= \left(\frac{i^{180} + i^{178} + i^{176} + i^{174} + i^{172}}{i^{170} + i^{168} + i^{166} + i^{164} + i^{162}}\right)$$

$$= \left(\frac{(i^4)^{45} + (i^4)^{44}.i^2 + (i^4)^{44} + (i^4)^{43}.i^2 + (i^4)^{43}}{(i^4)^{42}.i^2 + (i^4)^{42} + (i^4)^{41}.i^2 + (i^4)^{41} + (i^4)^{40}.i^2}\right)$$

$$= \left(\frac{(1)^{45} + (1)^{44}.i^2 + (1)^{44} + (1)^{43}.i^2 + (1)^{43}}{(1)^{42}.i^2 + (1)^{42} + (1)^{41}.i^2 + (1)^{41} + (1)^{40}.i^2}\right)$$

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

$$= \left(\frac{1 - 1 + 1 - 1 + 1}{-1 + 1 - 1 + 1 - 1}\right)$$

$$= \left(\frac{1}{-1}\right)$$

= -1

Q. 4. Evaluate ($i^{4n+1} - i^{4n-1}$)

Answer : We have, $i^{4n+1} - i^{4n-1}$

$= i^{4n}.i - i^{4n}.i^{-1}$

$= (i^4)^n.i - (i^4)^n.\ i^{-1}$

$= (1)^n.i - (1)^n.\ i^{-1}$

$= i - i^{-1}$

$$= i - \frac{1}{i}$$

$$= \frac{i^2 - 1}{i}$$

$$= \frac{-1 - 1}{i}$$

$$= \frac{-2}{i} \times \frac{i}{i}$$

$$= \frac{-2i}{i^2} = \frac{-2i}{-1}$$

= 2i

Q. 5. Evaluate $\left(\sqrt{36} \times \sqrt{-25}\right)$**.**

Answer : We have, $\left(\sqrt{36} \times \sqrt{-25}\right)$

$$= 6 \times \sqrt{-1 \times 25}$$

$$= 6 \times \left(\sqrt{-1} \times \sqrt{25}\right)$$

$$= 6 \times \left(\sqrt{-1} \times 5\right)$$

= 6×5i = 30i

Q. 6. Find the sum (i^n+ i^{n+1} + i^{n+2} + i^{n+3}), where n N.

Answer : We have i^n+ i^{n+1} + i^{n+2} + i^{n+3}

= i^n+ $i^n.i$ + $i^n.i^2$ + $i^n.i^3$

= i^n (1+ i +i^2 + i^3)

= i^n (1 + i -1 –i)

= i^n (0) = 0

Q. 7. Find the sum (i + i^2 + i^3 + i^4 +…. up to 400 terms)., where n N.

Answer : We have, $i + i^2 + i^3 + i^4 + \ldots$ up to 400 terms

We know that given series is GP where a=i , r = i and n = 400

Thus, $S = \frac{a(1-r^n)}{1-r}$

$$= \frac{i(1-(i)^{400})}{1-i}$$

$$= \frac{i(1-(i^4)^{100})}{1-i}$$

$$= \frac{i(1-1^{100})}{1-i} \ [\because i^4 = 1]$$

$$= \frac{i(1-1)}{1-i} = 0$$

Q. 8. Evaluate $(1 + i^{10} + i^{20} + i^{30})$.

Answer : We have, $1 + i^{10} + i^{20} + i^{30}$

$= 1 + (i^4)^2.i^2 + (i^4)^5 + (i^4)^7.i^2$

We know that, $i^4 = 1$

$\Rightarrow 1 + (1)^2.i^2 + (1)^5 + (1)^7.i^2$

$= 1 + i^2 + 1 + i^2$

$= 1 - 1 + 1 - 1$

$= 0$

Q. 9. Evaluate: $\left(i^{41} + \frac{1}{i^{71}}\right)$.

Answer : We have, $\left(i^{41} + \frac{1}{i^{71}}\right)$

$i^{41} = i^{40} . i = i$

$i^{71} = i^{68} . i^3 = -i$

Therefore,

$$\left(i^{41}+\frac{1}{i^{71}}\right)=i-\frac{1}{i}=\frac{i^2-1}{i}$$

$$\left(i^{41}+\frac{1}{i^{71}}\right)=\ -\frac{2}{i}\times\frac{i}{i}$$

$$\left(i^{41}+\frac{1}{i^{71}}\right)=\ -\frac{2i}{i^2}=2i$$

Hence, $\left(i^{41}+\frac{1}{i^{71}}\right)=2i$

Q. 10. Find the least positive integer n for which $\left(\frac{1+\mathrm{i}}{1-\mathrm{i}}\right)^{\mathrm{n}}=1$**.**

Answer : We have, $\left(\frac{1+\mathrm{i}}{1-\mathrm{i}}\right)^{\mathrm{n}}=1$

Now, $\frac{1+\mathrm{i}}{1-\mathrm{i}}=\frac{1+\mathrm{i}}{1-\mathrm{i}}\times\frac{1+\mathrm{i}}{1+\mathrm{i}}$

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

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

$$=\frac{1+2\mathrm{i}-1}{2}$$

$$=\mathrm{i}$$

$\therefore\left(\frac{1+\mathrm{i}}{1-\mathrm{i}}\right)^{\mathrm{n}}=(\mathrm{i})^{\mathrm{n}}=1\Rightarrow \mathrm{n}$ is multiple of 4

∴ The least positive integer n is 4

Q. 11. Express $(2-3i)^3$ in the form (a + ib).

Answer : We have, $(2 - 3i)^3$

$= 2^3 - 3 \times 2^2 \times 3i - 3 \times 2 \times (3i)^2 - (3i)^3$

$= 8 - 36i + 54 + 27i$

$= 46 - 9i.$

Q. 12. Express $\frac{(3+i\sqrt{5})(3-\sqrt{5})}{(\sqrt{3}+\sqrt{2}i)-(\sqrt{3}-\sqrt{2}i)}$ in the form (a + ib).

Answer : We have, $\frac{(3+i\sqrt{5})(3-i\sqrt{5})}{(\sqrt{3}+\sqrt{2}i)-(\sqrt{3}-\sqrt{2}i)}$

$$= \frac{(3)^2 - (i\sqrt{5})^2}{\sqrt{3}+\sqrt{2}i-\sqrt{3}+\sqrt{2}i} \quad [\because (a+b)(a-b) = a^2 - b^2]$$

$$= \frac{9+5}{2\sqrt{2}i} \times \frac{\sqrt{2}i}{\sqrt{2}i}$$

$$= \frac{14\sqrt{2}i}{2(\sqrt{2}i)^2}$$

$$= \frac{7\sqrt{2}i}{-2}$$

$$= \frac{-7\sqrt{2}i}{2}$$

Q. 13. Express $\frac{3-\sqrt{-16}}{1-\sqrt{-9}}$ in the form (a + ib).

Answer : We have, $\frac{3-\sqrt{-16}}{1-\sqrt{-9}}$

We know that $\sqrt{-1} = i$

Therefore,

$$\frac{3-\sqrt{-16}}{1-\sqrt{-9}}=\frac{3-4i}{1-3i}$$

$$\frac{3-\sqrt{-16}}{1-\sqrt{-9}}=\frac{3-4i}{1-3i}\times\frac{1+3i}{1+3i}$$

$$\frac{3-\sqrt{-16}}{1-\sqrt{-9}}=\frac{3+9i-4i-12\,i^2}{(1)^2-(3i)^2}$$

$$\frac{3-\sqrt{-16}}{1-\sqrt{-9}}=\frac{15+5i}{1+9}=\frac{15}{10}+\frac{5i}{10}=\frac{3}{2}+\frac{1}{2}i$$

Hence,

$$\frac{3-\sqrt{-16}}{1-\sqrt{-9}}=\frac{3}{2}+\frac{i}{2}$$

Q. 14. Solve for x: (1 – i) x + (1 + i) y = 1 – 3i.

Answer : We have, (1 – i) x + (1 + i) y = 1 – 3i

⇒ x-ix+y+iy = 1-3i

⇒ (x+y)+i(-x+y) = 1-3i

On equating the real and imaginary coefficients we get,

⇒ x+y = 1 (i) and –x+y = -3 (ii)

From (i) we get

x = 1-y

Substituting the value of x in (ii), we get

-(1-y)+y=-3

⇒ -1+y+y = -3

⇒ 2y = -3+1

$\Rightarrow$ y = -1

$\Rightarrow$ x=1-y = 1-(-1)=2

Hence, x=2 and y = -1

Q. 15. Solve for x: $x^2 - 5ix - 6 = 0$.

Answer : We have, $x^2 - 5ix - 6 = 0$

Here, $b^2-4ac = (-5i)^2-4\times1\times-6$

$= 25i^2+24 = -25+24 = -1$

Therefore, the solutions are given by $x = \frac{-(-5i)\pm\sqrt{-1}}{2\times1}$

$$x = \frac{5i \pm i}{2 \times 1}$$

$$x = \frac{5i \pm i}{2}$$

Hence, x= 3i and x = 2i

Q. 16. Find the conjugate of $\frac{1}{(3+4i)}$.

Answer : Let $z = \frac{1}{3+4i}$

$$= \frac{1}{3+4i} \times \frac{3-4i}{3-4i} = \frac{3-4i}{9+16}$$

$$= \frac{3}{25} - \frac{4}{25}i$$

$$\Rightarrow \bar{z} = \frac{3}{25} + \frac{4}{25}i$$

Q. 17. If z = (1 – i), find z^{-1}.

Answer : We have, z = (1 – i)

$\Rightarrow \bar{z} = 1 + i$

$\Rightarrow |z|^2 = (1)^2 + (-1)^2 = 2$

∴ The multiplicative inverse of (1 – i),

$$z^{-1} = \frac{\bar{z}}{|z|^2} = \frac{1+i}{2}$$

$$z^{-1} = \frac{1}{2} + \frac{1}{2}i$$

Q. 18. If z = $\left(\sqrt{5}+3i\right)$, find z^{-1}.

Answer : We have, $z = (\sqrt{5} + 3\,i)$

$\Rightarrow \bar{z} = (\sqrt{5} - 3\,i)$

$\Rightarrow |z|^2 = \left(\sqrt{5}\right)^2 + (3)^2$

$= 5 + 9 = 14$

∴ The multiplicative inverse of $(\sqrt{5} + 3\,i)$,

$$z^{-1} = \frac{\bar{z}}{|z|^2} = \frac{\sqrt{5} - 3\,i}{14}$$

$$z^{-1} = \frac{\sqrt{5}}{14} + \frac{3}{14}i$$

Q. 19. Prove that arg (z) + arg $\left(\bar{z}\right)$ = 0

Answer : Let z = r(cosθ + i sinθ)

⇒ arg(z) = θ

Now, $\overline{z} = r(\cos\theta - i\sin\theta) = r(\cos(-\theta) + i\sin(-\theta))$

$\Rightarrow \arg(\overline{z}) = -\theta$

Thus, arg (z) + $\arg(\overline{z})$ = θ - θ = 0

Hence proved.

Q. 20. If |z| = 6 and arg (z) = $\frac{3\pi}{4}$, find z.

Answer : We have, |z| = 6 and arg (z) = $\frac{3\pi}{4}$

Let z = r(cosθ + i sinθ)

We know that, |z| = r = 6

And arg (z) = θ = $\frac{3\pi}{4}$

Thus, z = r(cosθ + i sinθ) = $6\left(\cos\frac{3\pi}{4} + i\sin\frac{3\pi}{4}\right)$

Q. 21. Find the principal argument of (–2i).

Answer : Let, z = -2i

Let 0 = rcosθ and -2 = rsinθ

By squaring and adding, we get

$(0)^2 + (-2)^2 = (r\cos\theta)^2 + (r\sin\theta)^2$

$\Rightarrow 0+4 = r^2(\cos^2\theta + \sin^2\theta)$

$\Rightarrow 4 = r^2$

$\Rightarrow r = 2$

∴ cosθ= 0 and sinθ=-1

Since, θ lies in fourth quadrant, we have

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

Since, θ ∈ (-π ,π] it is principal argument.

Q. 22. Write the principal argument of (1 + i$\sqrt{3}$)^2.

Answer : Let, $z = \left(1 + i\sqrt{3}\right)^2$

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

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

$$z = 0 + 2\sqrt{3}i$$

Let 0 = rcosθ and 2√3 = rsinθ

By squaring and adding, we get

$(0)^2 + (2\sqrt{3})^2 = (r\cos\theta)^2 + (r\sin\theta)^2$

$\Rightarrow 0+(2\sqrt{3})^2 = r^2(\cos^2\theta + \sin^2\theta)$

$\Rightarrow (2\sqrt{3})^2 = r^2$

$\Rightarrow r = 2\sqrt{3}$

∴ cosθ= 0 and sinθ=1

Since, θ lies in first quadrant, we have

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

Since, θ ∈ (-π ,π] it is principal argument.

Q. 23. Write –9 in polar form.

Answer : We have, z = –9

Let -9 = rcosθ and 0 = rsinθ

By squaring and adding, we get

$(-9)^2 + (0)^2 = (r\cos\theta)^2 + (r\sin\theta)^2$

$\Rightarrow 81 = r^2(\cos^2\theta + \sin^2\theta)$

$\Rightarrow 81 = r^2$

$\Rightarrow r = 9$

$\therefore \cos\theta = -1 \text{ and } \sin\theta = 0$

$\Rightarrow \theta = \pi$

Thus, the required polar form is 9(cos π+i sin π)

Q. 24. Write 2i in polar form.

Answer : Let, z = 2i

Let 0 = rcosθ and 2 = rsinθ

By squaring and adding, we get

$(0)^2 + (2)^2 = (r\cos\theta)^2 + (r\sin\theta)^2$

$\Rightarrow 0+4 = r^2(\cos^2\theta + \sin^2\theta)$

$\Rightarrow 4 = r^2$

$\Rightarrow r = 2$

$\therefore \cos\theta = 0 \text{ and } \sin\theta = 1$

Since, θ lies in first quadrant, we have

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

Thus, the required polar form is $2\left(\cos\left(\frac{\pi}{2}\right) + i\sin\left(\frac{\pi}{2}\right)\right)$

Q. 25. Write –3i in polar form.

Answer : Let, z = -3i

Let 0 = rcosθ and -3 = rsinθ

By squaring and adding, we get

$(0)^2 + (-3)^2 = (r\cos\theta)^2 + (r\sin\theta)^2$

$\Rightarrow 0+9 = r^2(\cos^2\theta + \sin^2\theta)$

$\Rightarrow 9 = r^2$

$\Rightarrow r = 3$

∴ cosθ= 0 and sinθ=-1

Since, θ lies in fourth quadrant, we have

$$\theta = \frac{3\pi}{2}$$

Thus, the required polar form is $3\left(\cos\left(\frac{3\pi}{2}\right) + i\sin\left(\frac{3\pi}{2}\right)\right)$

Q. 26. Write z = (1 – i) in polar form.

Answer : We have, z = (1 – i)

Let 1 = rcosθ and -1 = rsinθ

By squaring and adding, we get

$(1)^2 + (-1)^2 = (r\cos\theta)^2 + (r\sin\theta)^2$

$\Rightarrow 1+1 = r^2(\cos^2\theta + \sin^2\theta)$

$\Rightarrow 2 = r^2$

$\Rightarrow r = \sqrt{2}$

$$\therefore \cos\theta = \frac{1}{\sqrt{2}} \text{ and } \sin\theta = \frac{-1}{\sqrt{2}}$$

Since, θ lies in fourth quadrant, we have

$$\theta = -\frac{\pi}{4}$$

Thus, the required polar form is $\sqrt{2}\left(\cos\left(-\frac{\pi}{4}\right) + i\sin\left(-\frac{\pi}{4}\right)\right)$

Q. 27. Write z = (–1 + i $\sqrt{3}$) in polar form.

Answer : We have, z = (–1 + i $\sqrt{3}$)

Let -1 = rcosθ and √3 = rsinθ

By squaring and adding, we get

$(-1)^2 + (\sqrt{3})^2 = (r\cos\theta)^2 + (r\sin\theta)^2$

$\Rightarrow 1+3 = r^2(\cos^2\theta + \sin^2\theta)$

$\Rightarrow 4 = r^2$

$\Rightarrow r = 2$

$$\therefore \cos\theta = \frac{-1}{2} \text{ and } \sin\theta = \frac{\sqrt{3}}{2}$$

Since, θ lies in second quadrant, we have

$$\theta = \pi - \frac{\pi}{3} = \frac{2\pi}{3}$$

Thus, the required polar form is $2\left(\cos\frac{2\pi}{3} + i\sin\frac{2\pi}{3}\right)$

Q. 28. If |z| = 2 and arg (z) = $\frac{\pi}{4}$, find z.

Answer : We have, |z| = 2 and arg (z) = $\frac{\pi}{4}$,

Let z = r(cosθ + i sinθ)

We know that, $|z| = r = 2$

And $\arg(z) = \theta = \frac{\pi}{4}$

Thus, $z = r(\cos\theta + i\sin\theta) = 2\left(\cos\frac{\pi}{4} + i\sin\frac{\pi}{4}\right)$