

RD Sharma
Solutions
Class 11 Maths
Chapter 13
Ex 13.3

Complex Numbers Ex 13.3 Q1(i)

$$\text{Let } z = -5 + 12i$$

$$\begin{aligned}\Rightarrow |z| &= \sqrt{(-5)^2 + 12^2} \\ &= \sqrt{25 + 144} \\ &= \sqrt{169} \\ &= 13\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{-5 + 12i} &= \pm \left\{ \sqrt{\frac{13 + (-5)}{2}} + i \sqrt{\frac{13 - (-5)}{2}} \right\} && (\because y > 0) \\ &= \pm \left\{ \sqrt{\frac{8}{2}} + i \sqrt{\frac{18}{2}} \right\} \\ &= \pm \{2 + 3i\}\end{aligned}$$

Complex Numbers Ex 13.3 Q1(ii)

$$\text{let } z = -7 - 24i$$

$$\begin{aligned}\text{then } |z| &= \sqrt{(-7)^2 + (-24)^2} \\ &= \sqrt{49 + 576} \\ &= \sqrt{625} \\ &= 25\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{-7 - 24i} &= \pm \left\{ \sqrt{\frac{25-7}{2}} - i \sqrt{\frac{25+7}{2}} \right\} \quad (\because y < 0) \\ &= \pm \left\{ \sqrt{\frac{18}{2}} - i \sqrt{\frac{32}{2}} \right\} \\ &= \pm \{ \sqrt{9} - i \sqrt{16} \} \\ &= \pm \{ 3 - 4i \}\end{aligned}$$

Complex Numbers Ex 13.3 Q1(iii)

$$\text{let } z = 1 - i$$

$$\begin{aligned}\text{then } |z| &= \sqrt{1^2 + (-1)^2} \\ &= \sqrt{1+1} \\ &= \sqrt{2}\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{1-i} &= \pm \left(\sqrt{\frac{\sqrt{2}+1}{2}} - i \sqrt{\frac{\sqrt{2}-1}{2}} \right) \quad (\because y < 0) \\ &= \pm \left(\sqrt{\frac{\sqrt{2}+1}{2}} - i \sqrt{\frac{\sqrt{2}-1}{2}} \right)\end{aligned}$$

Complex Numbers Ex 13.3 Q1(iv)

$$\text{let } z = -8 - 6i$$

$$\begin{aligned}\text{then } |z| &= \sqrt{(-8)^2 + (-6)^2} \\ &= \sqrt{64 + 36} \\ &= \sqrt{100} \\ &= 10\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{-8-6i} &= \pm \left\{ \sqrt{\frac{10-8}{2}} - i \sqrt{\frac{10+8}{2}} \right\} \quad (\because y < 0) \\ &= \pm \left\{ \sqrt{\frac{2}{2}} - i \sqrt{\frac{18}{2}} \right\} \\ &= \pm \{ \sqrt{1} - i \sqrt{9} \} \\ &= \pm \{ 1 - 3i \}\end{aligned}$$

Complex Numbers Ex 13.3 Q1(v)

$$\text{let } z = 8 - 15i$$

$$\begin{aligned}\text{then } |z| &= \sqrt{(8)^2 + (-15)^2} \\ &= \sqrt{64 + 225} \\ &= \sqrt{289} \\ &= 17\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{8 - 5i} &= \pm \left\{ \sqrt{\frac{17+8}{2}} - i \sqrt{\frac{17-8}{2}} \right\} \quad (\because y < 0) \\ &= \pm \left\{ \sqrt{\frac{25}{2}} - i \sqrt{\frac{9}{2}} \right\} \\ &= \pm \left\{ \frac{5}{\sqrt{2}} - i \frac{3}{\sqrt{2}} \right\} \\ &= \pm \frac{1}{\sqrt{2}} \{5 - 3i\}\end{aligned}$$

Complex Numbers Ex 13.3 Q1(vi)

$$\text{Let } z = -11 - 60\sqrt{-1}$$

$$\Rightarrow z = -11 - 60i \quad (\because \sqrt{-1} = i)$$

$$\begin{aligned}\text{Then } |z| &= \sqrt{(-11)^2 + (-60)^2} \\ &= \sqrt{121 + 3600} \\ &= \sqrt{3721} \\ &= 61\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{-11 - 60i} &= \pm \left\{ \sqrt{\frac{61-11}{2}} - i \sqrt{\frac{61+11}{2}} \right\} \quad (\because y < 0) \\ &= \pm \left\{ \sqrt{\frac{50}{2}} - i \sqrt{\frac{72}{2}} \right\} \\ &= \pm \left\{ \sqrt{25} - i \sqrt{36} \right\} \\ &= \pm \{5 - 6i\}\end{aligned}$$

Complex Numbers Ex 13.3 Q1(vii)

$$\text{let } z = 1 + 4\sqrt{-3}$$

$$= 1 + 4\sqrt{3} \times \sqrt{-1} \quad (\because \sqrt{-3} = \sqrt{3} \times \sqrt{-1})$$

$$\Rightarrow z = 1 + 4\sqrt{3}i$$

$$\begin{aligned}\therefore |z| &= \sqrt{(1)^2 + (4\sqrt{3})^2} \\ &= \sqrt{1 + 48} \\ &= \sqrt{49} \\ &= 7\end{aligned}$$

$$\begin{aligned}\text{Hence } \sqrt{1 + 4\sqrt{-3}} &= \pm \left\{ \sqrt{\frac{7+1}{2}} + i\sqrt{\frac{7-1}{2}} \right\} \quad (\because y > 0) \\ &= \pm \left\{ \sqrt{\frac{8}{2}} + i\sqrt{\frac{6}{2}} \right\} \\ &= \pm \left\{ \sqrt{4} + i\sqrt{3} \right\} \\ &= \pm \left\{ 2 + \sqrt{3}i \right\}\end{aligned}$$

Complex Numbers Ex 13.3 Q1(viii)

$$\text{let } z = 4i$$

$$\begin{aligned}\text{then } |z| &= |4i| \\ &= 4|i| && (\because |z_1 z_2| = |z_1| \times |z_2|) \\ &= 4 && (\because |i| = 1)\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{4i} &= \pm \left\{ \sqrt{\frac{4+0}{2}} + i\sqrt{\frac{4-0}{2}} \right\} \quad (\because y > 0) \\ &= \pm \left\{ \sqrt{2} + i\sqrt{2} \right\} \\ &= \pm\sqrt{2} (1+i)\end{aligned}$$

Complex Numbers Ex 13.3 Q1(ix)

$$\text{let } z = -i$$

$$\begin{aligned}\text{then } |z| &= |-i| \\ &= |-1| \times |i| && (\because |z_1 z_2| = |z_1| \times |z_2|) \\ &= 1 \times i && (\because |i| = 1) \\ &= 1\end{aligned}$$

$$\begin{aligned}\therefore \sqrt{-i} &= \pm \left\{ \sqrt{\frac{1+0}{2}} - i\sqrt{\frac{1-0}{2}} \right\} \quad (\because y < 0) \\ &= \pm \left\{ \frac{1}{\sqrt{2}} - \frac{i}{\sqrt{2}} \right\} \\ &= \pm \frac{1}{\sqrt{2}} (1-i)\end{aligned}$$