RD Sharma Solutions Class 11 Maths Chapter 13 Ex 13.3

Complex Numbers Ex 13.3 Q1(i)

Let $z = -5 + 12i$

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

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

Complex Numbers Ex 13.3 Q1(ii)

let $z = -7 - 24i$

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

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

Complex Numbers Ex 13.3 Q1(iii)

let $z = 1 - i$

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

$$\therefore \sqrt{1 - i} = \pm\left(\sqrt{\frac{\sqrt{2}+1}{2}} - i\sqrt{\frac{\sqrt{2}-1}{2}}\right) \qquad (\because y < 0)$$
$$= \pm\left(\sqrt{\frac{\sqrt{2}+1}{2}} - i\sqrt{\frac{\sqrt{2}-1}{2}}\right)$$

Complex Numbers Ex 13.3 Q1(iv)

let $z = -8 - 6i$

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

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

Complex Numbers Ex 13.3 Q1(v)

let $z = 8 - 15i$

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

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

Complex Numbers Ex 13.3 Q1(vi)

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

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

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

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

Complex Numbers Ex 13.3 Q1(vii)

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

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

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

$\therefore |z| = \sqrt{(1)^2 + \left(4\sqrt{3}\right)^2}$

$= \sqrt{1 + 48}$

$= \sqrt{49}$

$= 7$

Hence $\sqrt{1 + 4\sqrt{-3}} = \pm\left\{\sqrt{\frac{7+1}{2}} + i\sqrt{\frac{7-1}{2}}\right\} \quad (\because y > 0)$

$= \pm\left\{\sqrt{\frac{8}{2}} + i\sqrt{\frac{6}{2}}\right\}$

$= \pm\left\{\sqrt{4} + i\sqrt{3}\right\}$

$= \pm\left\{2 + \sqrt{3}i\right\}$

Complex Numbers Ex 13.3 Q1(viii)

let $z = 4i$

then $|z| = |4i|$

$= 4|i| \quad (\because |z_1 z_2| = |z_1| \times |z_2|)$

$= 4 \quad (\because |i| = 1)$

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

$= \pm\left\{\sqrt{2} + i\sqrt{2}\right\}$

$= \pm\sqrt{2}(1 + i)$

Complex Numbers Ex 13.3 Q1(ix)

let $z = -i$

then $|z| = |-i|$

$= |-1| \times |i| \quad (\because |z_1 z_2| = |z_1| \times |z_2|)$

$= 1 \times i \quad (\because |i| = 1)$

$= 1$

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

$= \pm\left\{\frac{1}{\sqrt{2}} - \frac{i}{\sqrt{2}}\right\}$

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