



Complex Numbers Ex 13.2 Q1(ix)

$$\begin{aligned}(1+2i)^{-3} &= \frac{1}{(1+2i)^3} & \left( \because z^{-3} = \frac{1}{z^3} \right) \\&= \frac{1}{1^3 + (2i)^3 + 3 \times 1 \times 2i(1+2i)} \\&= \frac{1}{1^3 + 2^3 \times i^3 + 6i(1+2i)} \\&= \frac{1}{1 - 8i + 6i - 12} & \left( \because i^3 = -i \text{ and } i^2 = -1 \right) \\&= \frac{1}{-11 - 2i} \\&= \frac{1}{-11 - 2i} \times \frac{(-11 + 2i)}{(-11 + 2i)} \\&= \frac{-11 + 2i}{(-11)^2 + 2^2} \\&= \frac{-11 + 2i}{121 + 4} \\&= \frac{-11}{125} + \frac{2}{125}i\end{aligned}$$

$$\therefore (1+2i)^{-3} = \frac{-11}{125} + \frac{2}{125}i$$

Complex Numbers Ex 13.2 Q1(x)

$$\begin{aligned}
\frac{3-4i}{(4-2i)(1+i)} &= \frac{3-4i}{4(1+i)-2i(1+i)} \\
&= \frac{3-4i}{4+4i-2i+2} \\
&= \frac{3-4i}{6+2i} \\
&= \frac{3-4i}{6+2i} \times \frac{6-2i}{6-2i} \\
&= \frac{3(6-2i)-4i(6-2i)}{6^2+2^2} \\
&= \frac{18-6i-24i-8}{36+4} \\
&= \frac{10-30i}{40} \\
&= \frac{10(1-3i)}{40} \\
&= \frac{1-3i}{4} \\
&= \frac{1}{4} - \frac{3}{4}i
\end{aligned}$$

$$\therefore \frac{3-4i}{(4-2i)(1+i)} = \frac{1}{4} - \frac{3}{4}i$$

Complex Numbers Ex 13.2 Q1(xi)

$$\begin{aligned}
\left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right) &= \frac{(1+i-2(1-4i))}{(1-4i)(1+i)} \times \frac{3-4i}{5+i} \\
&= \frac{(1+i-2+8i)}{1(1+i)-4i(1+i)} \times \frac{3-4i}{5+i} \\
&= \frac{(1+i-2+8i)}{1(1+i)-4i(1+i)} \times \frac{3-4i}{5+i} \\
&= \frac{(-1+9i)}{(1+i-4i+4)} \times \frac{3-4i}{5+i} \\
&= \frac{-1(3-4i)+9i(3-4i)}{(5-3i)(5+i)} \\
&= \frac{-3+4i+27i+36}{5(5+i)-3i(5+i)} \\
&= \frac{33+31i}{25+5i-15i+3} \\
&= \frac{33+31i}{28-10i} \\
&= \frac{(33+31i)}{28-10i} \times \frac{(28+10i)}{28+10i} \\
&= \frac{33 \times 28 + 33 \times 10i + 31i \times 28 + 31i \times 10i}{28^2 + 10^2} \\
&= \frac{924 + 330i + 868i - 310}{784 + 100} \\
&= \frac{614 + 1198i}{884} \\
&= \frac{614}{884} + \frac{1198}{884}i \\
&= \frac{307}{442} + \frac{599}{442}i
\end{aligned}$$

$$\therefore \left(\frac{1}{1-4i} - \frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right) = \frac{307}{442} + \frac{599}{442}i$$

Complex Numbers Ex 13.2 Q1(xii)

We have

$$\begin{aligned}
\frac{5+\sqrt{2}i}{1-\sqrt{2}i} &= \frac{5+\sqrt{2}i}{1-\sqrt{2}i} \times \frac{1+\sqrt{2}i}{1+\sqrt{2}i} \\
&= \frac{5(1+\sqrt{2}i)+\sqrt{2}i(1+\sqrt{2}i)}{1+2} \\
&= \frac{5+5\sqrt{2}i+\sqrt{2}i-2}{3} \\
&= \frac{3+6\sqrt{2}i}{3} \\
&= 1+2\sqrt{2}i
\end{aligned}$$

$$\text{Therefore, } \frac{5+\sqrt{2}i}{1-\sqrt{2}i} = 1+2\sqrt{2}i$$

Complex Numbers Ex 13.2 Q2(i)

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