Complex Numbers Ex 13.2 Q1(ix)

$$(1+2i)^{-3} = \frac{1}{(1+2i)^3} \qquad \left(\because z^{-3} = \frac{1}{z^3}\right)$$

$$= \frac{1}{1^3 + (2i)^3 + 3 \times 1 \times 2i\,(1+2i)}$$

$$= \frac{1}{1^3 + 2^3 \times i^3 + 6i\,(1+2i)}$$

$$= \frac{1}{1 - 8i + 6i - 12} \qquad \left(\because i^3 = -i \text{ and } i^2 = -1\right)$$

$$= \frac{1}{-11-2i}$$

$$= \frac{1}{-11-2i} \times \frac{(-11+2i)}{(-11+2i)}$$

$$= \frac{-11+2i}{(-11)^2 + 2^2}$$

$$= \frac{-11+2i}{121+4}$$

$$= \frac{-11}{125} + \frac{2}{125}i$$

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

Complex Numbers Ex 13.2 Q1(x)

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

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

$$= \frac{3-4i}{6+2i}$$

$$= \frac{3-4i}{6+2i} \times \frac{6-2i}{6-2i}$$

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

$$= \frac{18-6i-24i-8}{36+4}$$

$$= \frac{10-30i}{40}$$

$$= \frac{10(1-3i)}{40}$$

$$= \frac{1-3i}{4}$$

$$= \frac{1}{4} - \frac{3}{4}i$$

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

Complex Numbers Ex 13.2 Q1(xi)

$$\left(\frac{1}{1-4i}-\frac{2}{1+i}\right)\left(\frac{3-4i}{5+i}\right)=\frac{\left(1+i-2\left(1-4i\right)\right)}{\left(1-4i\right)\left(1+i\right)}\times\frac{3-4i}{5+i}$$
$$=\frac{\left(1+i-2+8i\right)}{1\left(1+i\right)-4i\left(1+i\right)}\times\frac{3-4i}{5+i}$$
$$=\frac{\left(1+i-2+8i\right)}{1\left(1+i\right)-4i\left(1+i\right)}\times\frac{3-4i}{5+i}$$
$$=\frac{\left(-1+9i\right)}{\left(1+i-4i+4\right)}\times\frac{3-4i}{5+i}$$
$$=\frac{-1\left(3-4i\right)+9i\left(3-4i\right)}{\left(5-3i\right)\left(5+i\right)}$$
$$=\frac{-3+4i+27i+36}{5\left(5+i\right)-3i\left(5+i\right)}$$
$$=\frac{33+31i}{25+5i-15i+3}$$
$$=\frac{33+31i}{28-10i}$$
$$=\frac{\left(33+31i\right)}{28-10i}\times\frac{\left(28+10i\right)}{28+10i}$$
$$=\frac{33\times28+33\times10i+31i\times28+31i\times10i}{28^2+10^2}$$
$$=\frac{924+330i+868i-310}{784+100}$$
$$=\frac{614+1198i}{884}$$
$$=\frac{614}{884}+\frac{1198}{884}i$$
$$=\frac{307}{442}+\frac{599}{442}i$$

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

Complex Numbers Ex 13.2 Q1(xii)

We have

$$\frac{5+\sqrt{2}i}{1-\sqrt{2}i}=\frac{5+\sqrt{2}i}{1-\sqrt{2}i}\times\frac{1+\sqrt{2}i}{1+\sqrt{2}i}$$
$$=\frac{5\left(1+\sqrt{2}i\right)+\sqrt{2}i\left(1+\sqrt{2}i\right)}{1+2}$$
$$=\frac{5+5\sqrt{2}i+\sqrt{2}i-2}{3}$$
$$=\frac{3+6\sqrt{2}i}{3}$$
$$=1+2\sqrt{2}i$$

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

Complex Numbers Ex 13.2 Q2(i)

*********** END **********