Answers: Arithmetic on complex numbers

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Summary

Answers to questions relating to the guide on arithmetic on complex numbers.

*These are the answers to* [*Questions: Arithmetic on complex numbers*](../questions/qs-arithmeticoncomplexnumbers.qmd)*.*

**Please attempt the questions before reading these answers!**

## Q1

1.1. $ \left(5+7i\right)−\left(2+3i\right)=3+4i$

1.2. $ \left(8+6i\right)+\left(2−4i\right)=10+2i$

1.3. $ \left(4−i\sqrt{2}\right)−\left(3+i\sqrt{7}\right)=1−\left(\sqrt{2}+\sqrt{7}\right)i$

1.4. $ \left(\sqrt{8}+4i\right)−\left(\sqrt{5}+2i\right)=\left(2\sqrt{2}−\sqrt{5}\right)+2i$

1.5. $ \left(\sqrt{7}+3i\right)+\left(2−i\right)=\left(\sqrt{7}+2\right)+2i$

1.6. $ \left(5+i\sqrt{2}\right)−\left(7−i\right)+\left(\sqrt{3}+4i\right)=\left(\sqrt{3}−2\right)+\left(\sqrt{2}+5\right)i$

## Q2

2.1. $ \left(2+3i\right)\left(4+5i\right)=−7+22i$

2.2. $ \left(3+i\right)\left(2−i\right)=7−i$

2.3. $ 4\left(6+3i\right)=24+12i$

2.4. $ \left(1+i\right)^{2}=0+2i=2i$

2.5. $ \left(3+2i\right)^{3}=−9+46i$

2.6. $ \left(7−4i\right)^{2}\left(i−2\right)=−10+145i$

2.7. $ \left(1−i\sqrt{3}\right)^{3}=−8+0i=−8$

2.8. $ \left(5−2i\right)\left(5+2i\right)=29+0i=29$

2.9. $ \left(\sqrt{2}+i\sqrt{3}\right)(\sqrt{8}−i\sqrt{3)}=7+i\sqrt{6}$

## Q3

3.1. $ \frac{7−6i}{1+2i}=−1−4i$

3.2. $ \frac{4−i}{1+4i}=0−i=−i$

3.3. $ \frac{3}{5i}=0−\frac{3}{5}i=−\frac{3}{5}i$

3.4. $ \frac{4+2i}{3−i}=1+i$

3.5. $ \frac{9+i}{i}=1−9i$

3.6. $ \frac{−2−2i}{−2+2i}=0+i=i$

3.7. $ \frac{1+5i}{−3i}=−\frac{5}{3}+\frac{1}{3}i$

3.8. $ \frac{−4}{1−i}=−2−2i$

3.9. $ \frac{1−3i}{1+2i}=−1−i$

## Q4

4.1. $ \frac{\left(6+4i\right)\left(3−i\right)}{2i}=3−11i$

4.2. $ 3i\left(5−4i\right)+\left(6+2i\right)=18+17i$

4.3. $ \left(2+3i\right)\left(1−i\right)−\left(5−4i\right)=0+5i=5i$

4.4. $ \frac{\left(5+2i\right)+\left(4−i\right)}{1+i}=5−4i$

4.5. $ \frac{\left(2+i\right)^{3}}{\left(3+i\right)−\left(1+i\right)}=1+\frac{11}{2}i$

4.6. $ \left(\frac{6−3i}{2\left(1−i\right)}\right)^{2}=\frac{9}{2}+\frac{27}{8}i$

## Version history and licensing

v1.0: initial version created 11/24 by Charlotte McCarthy as part of a University of St Andrews VIP project.

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