

Chapter 1

Exercise 1A

1. $13 + 11i$
2. $5 + 2i$
3. $4 + i$
4. $13 + i$
5. -3
6. $59 + 9i$
7. $1 - 4i$
8. $7 - 4i$
9. $4 + 2i$
10. $4i$
11. $12 + 15i$
12. $11 - 5i$
13. 0
14. $14 + 4i$
15. $24 - 12i$
16. $7 - 21i$
17. $12 + 5i$
18. $24 + 7i$
19. $3 + 2i$
20. $2\sqrt{2} + 2i$
21. $3i$
22. $7i$
23. $11i$
24. $100i$
25. $15i$
26. $i\sqrt{5}$
27. $2i\sqrt{3}$
28. $3i\sqrt{5}$
29. $10i\sqrt{2}$
30. $7i\sqrt{3}$
31. $x = -1 \pm 2i$
32. $x = 1 \pm 3i$
33. $x = -2 \pm 5i$
34. $x = -5 \pm i$
35. $x = 3 \pm 3i$
36. $x = -2 \pm i\sqrt{3}$
37. $x = 3 \pm i\sqrt{2}$
38. $x = 1 \pm i\sqrt{6}$
39. $x = -\frac{5}{2} \pm \frac{5i\sqrt{3}}{2}$
40. $x = -\frac{3}{2} \pm \frac{-3 \pm i\sqrt{11}}{2}$

Exercise 1B

1. $11 + 23i$
2. $36 + 33i$
3. $15 + 23i$
4. $2 - 110i$
5. $-5 - 25i$
6. $39 + 80i$
7. $-77 - 36i$
8. $10i$
9. $54 - 62i$
10. $-46 + 9i$
11. -1
12. 81
13. $2i$
14. $-60i$
15. 16

Exercise 1C

1. (a) $8 - 2i$
(b) $6 + 5i$
(c) $\frac{2}{3} + \frac{1}{2}i$
(d) $\sqrt{5} - i\sqrt{10}$
2. (a) $z + z^* = 12, zz^* = 45$
(b) $z + z^* = 20, zz^* = 125$
(c) $z + z^* = \frac{3}{2}, zz^* = \frac{5}{8}$
(d) $z + z^* = 2\sqrt{5}, zz^* = 50$
3. $9 + 8i$
4. $\frac{22}{25} - \frac{21}{25}i$
5. $\frac{37}{10} + \frac{1}{10}i$
6. $\frac{3}{5} + \frac{1}{5}i$
7. $-\frac{6}{5} - \frac{7}{5}i$
8. $-\frac{11}{50} + \frac{27}{50}i$
9. $\frac{31}{2} + \frac{25}{2}i$
10. $\frac{6}{17} - \frac{7}{17}i$

11. $-\frac{31}{2} - \frac{17}{2}i$

12. $\frac{3}{5} + \frac{4}{5}i$

13. $\frac{7}{2} + \frac{1}{2}i$

14. $\frac{41}{5} - \frac{3}{5}i$

15. $\frac{8}{5} + \frac{9}{5}i$

16. $6 + 8i$

17. (a) $-1 + 5i, -1 - 5i$

(b) -2

(c) 26

18. (a) $4 + 3i, 4 - 3i$

(b) 8

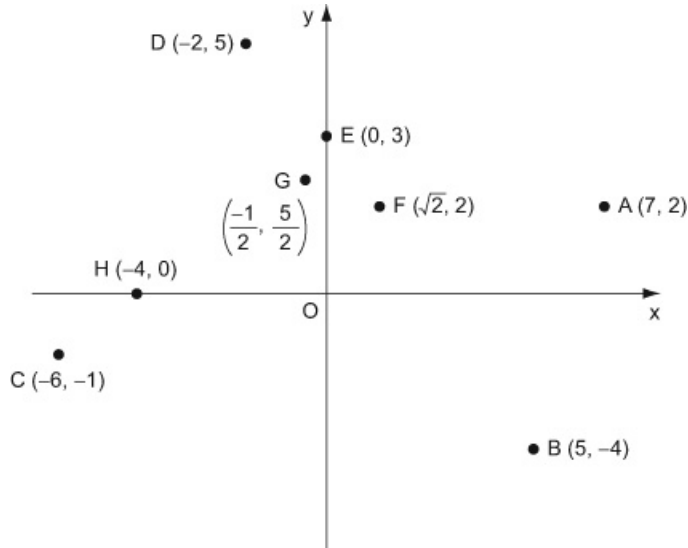
(c) 25

19. $x^2 - 4x + 13 = 0$

20. $x^2 + 10x + 41 = 0$

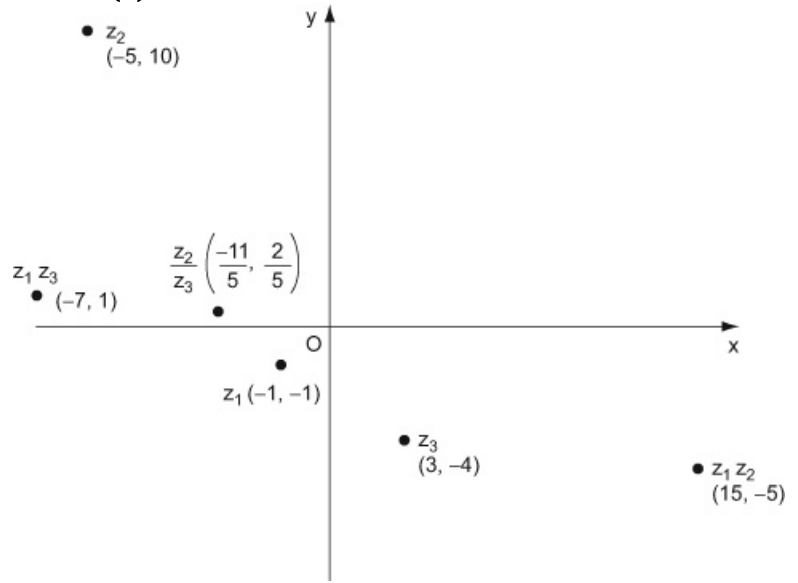
Exercise 1D

1.

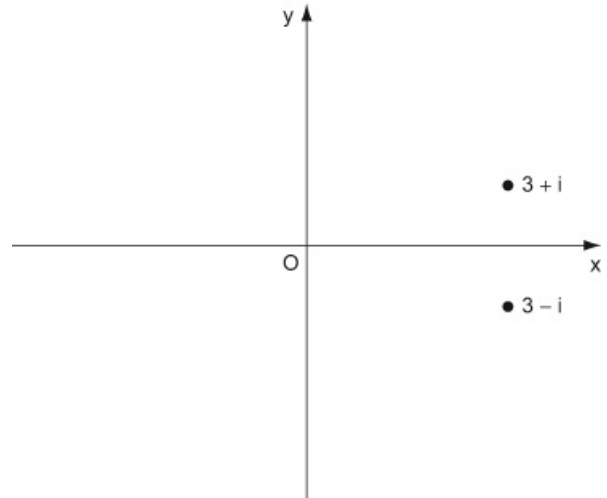


2. (a) $-\frac{11}{5} + \frac{2}{5}i$

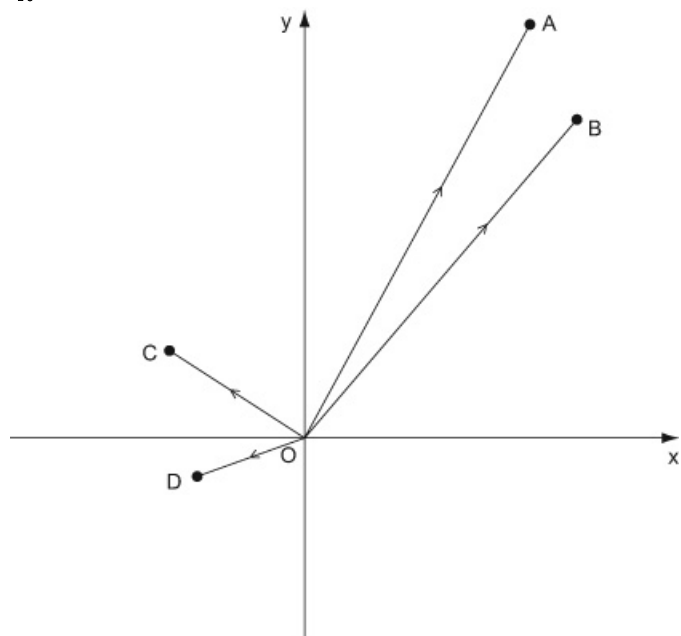
(b)



3.

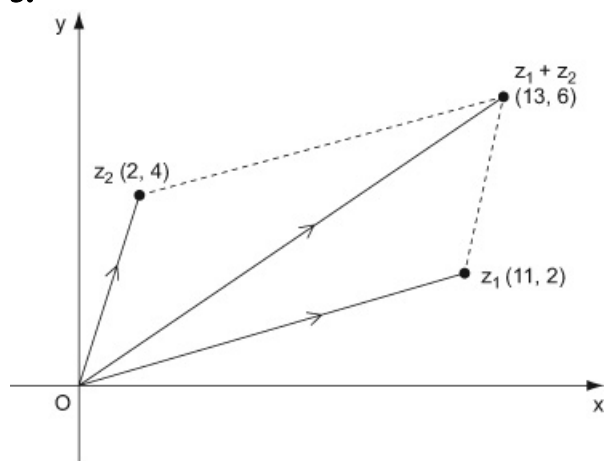


4.

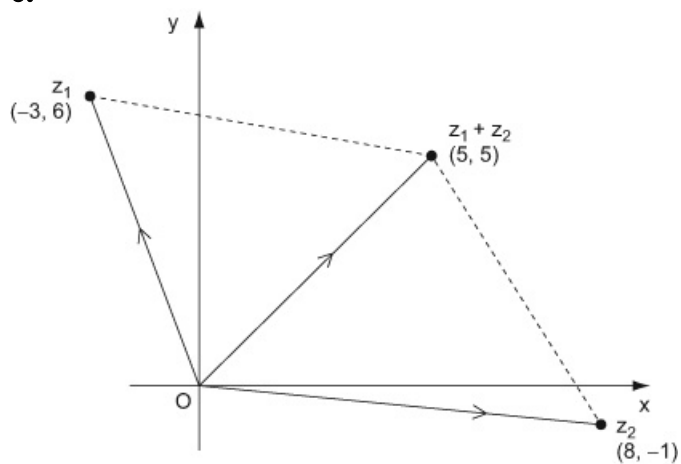


$$|OA| = 13, |OB| = 2\sqrt{34}, |OC| = 2\sqrt{5}, |OD| = \sqrt{10}$$

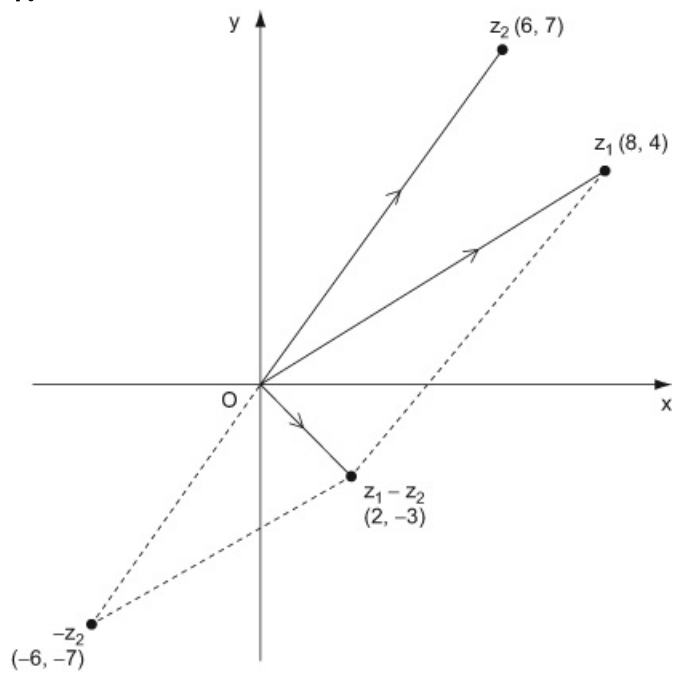
5.



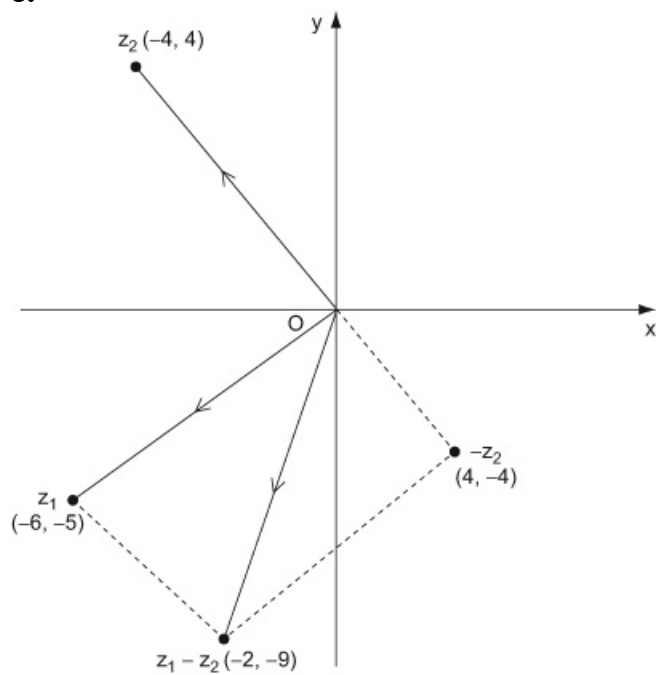
6.



7.



8.



Exercise 1E

1. Modulus = 13, argument = 0.39
2. Modulus = 2, argument = $\frac{\pi}{6}$
3. Modulus = $3\sqrt{5}$, argument = 2.03
4. Modulus = $2\sqrt{2}$, argument = $-\frac{\pi}{4}$
5. Modulus = $\sqrt{113}$, argument = -2.42
6. Modulus = $\sqrt{137}$, argument = 1.92
7. Modulus = $\sqrt{15}$, argument = -0.46
8. Modulus = 17, argument = -2.06

Exercise 1F

1. (a) $2\sqrt{2}(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})$
(b) $3(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2})$
(c) $5(\cos 2.21 + i \sin 2.21)$
(d) $2(\cos(-\frac{\pi}{3}) + i \sin(-\frac{\pi}{3}))$
(e) $\sqrt{29}(\cos(-1.95) + i \sin(-1.95))$
(f) $20(\cos \pi + i \sin \pi)$
(g) $25(\cos(-1.29) + i \sin(-1.29))$
(h) $5\sqrt{2}(\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4})$
2. (a) $\frac{3}{2}(\cos(-\frac{\pi}{3}) + i \sin(-\frac{\pi}{3}))$
(b) $\frac{\sqrt{5}}{5}(\cos 0.46 + i \sin 0.46)$
(c) $1(\cos \frac{\pi}{2} + i \sin \frac{\pi}{2})$
3. (a) $3 + 3i$
(b) $-3\sqrt{2} + 3\sqrt{2}i$
(c) $\frac{\sqrt{3}}{2} + \frac{3}{2}i$
(d) $-7i$
(e) $-2\sqrt{3} - 2i$

4. (a) $|z_1| = 5, |z_2| = 5, z_1z_2 = 24 + 7i$
(b) $|z_1| = \sqrt{5}, |z_2| = 2\sqrt{5}, z_1z_2 = -8 + 6i$
(c) $|z_1| = 13, |z_2| = 25, z_1z_2 = -253 + 204i$
(d) $|z_1| = \sqrt{5}, |z_2| = \sqrt{5}, z_1z_2 = -2\sqrt{6} + i$

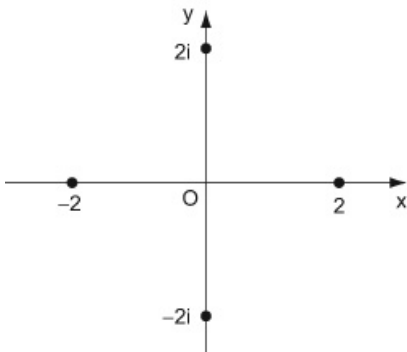
Exercise 1G

1. $a = 3, b = \frac{1}{2}$
2. $a = 7, b = -2$
3. $a = -3, b = 7$
4. 3
5. $a = 2$ and $b = 6$, or $a = -2$ and $b = -6$
6. $x = \frac{3}{13}, y = \frac{2}{13}$
7. $x = \frac{3}{2}, y = -\frac{1}{2}$
8. $x = -1, y = 1$, modulus = $\sqrt{2}$, argument = $\frac{3\pi}{4}$
9. $\pm(4 + 3i)$
10. $\pm(6 + 5i)$
11. $\pm(3 - 2i)$
12. $\pm(1 + i)$

Exercise 1H

1. $x^2 - 2x + 5 = 0$
2. $x^2 - 6x + 34 = 0$
3. $x^2 - 2ax + a^2 + 16 = 0$
4. Roots are $-1, -4 + 3i$ and $-4 - 3i$
5. Roots are $3, -\frac{1}{2} + \frac{1}{2}i$ and $-\frac{1}{2} - \frac{1}{2}i$
6. Roots are $-\frac{1}{2}, -\frac{1}{2} + \frac{\sqrt{3}}{2}i$ and $-\frac{1}{2} - \frac{\sqrt{3}}{2}i$
7. Roots are $4, -4 + i$ and $-4 - i$
8. Roots are $3, -3, 6 + 2i$ and $6 - 2i$
9. Roots are $2 + 3i, 2 - 3i, -3 + i$ and $-3 - i$

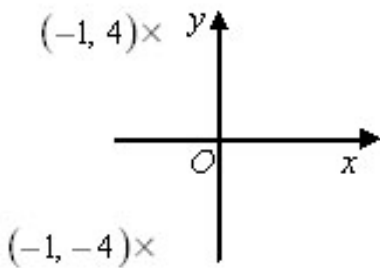
10.



11. $a = 1, b = 0, c = 2, d = 4, e = -8, f = 16$

Mixed exercise 11

1. (a) $-1 - 4i, -1 + 4i$
 (b)

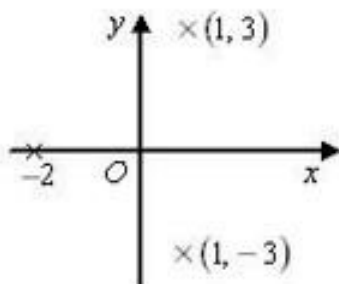


2. (a) (i) 2 (ii) $\frac{1}{2}$
 (b) (i) $-\frac{\pi}{6}$ (ii) $-\frac{5\pi}{6}$

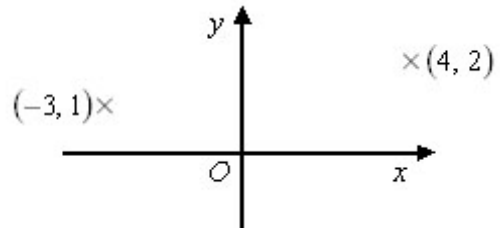
3. (a) (i) $\frac{3}{25} - \frac{4}{25}i$
 (b) $\frac{1}{5}$

(c) -143.1°
 4. (a) $x = 3, y = -1$
 (b) (i) $\sqrt{10}$ (ii) -0.322

5. $2 - i$ and -4
 6. (a) $1 - 3i$ and -2
 (b)

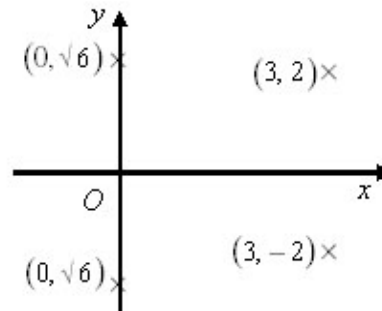


7. (a)



(b) $5\sqrt{2}$
 (c) $-1 - i$
 (d) $-\frac{3\pi}{4}$

8. (a) $3 - 2i, 3 + 2i, i\sqrt{6}, -i\sqrt{6}$
 (b)



9. (a) $\frac{\sqrt{5}}{2}$
 (b) 1