3. $-2, 1+\sqrt{3}\text{i}, 1-\sqrt{3}\text{i}$

4. $-\dfrac{\sqrt{2}+\sqrt{6}}{2}+\left(\dfrac{\sqrt{2}+\sqrt{6}}{2}\right)\text{i}$,

$\dfrac{\sqrt{2}-\sqrt{6}}{2}-\left(\dfrac{\sqrt{2}+\sqrt{6}}{2}\right)\text{i}$,

$\sqrt{2}-\sqrt{2}\text{i}$

5. $3\text{cis}\left(\dfrac{3\pi}{8}\right), 3\text{cis}\left(\dfrac{7\pi}{8}\right)$,

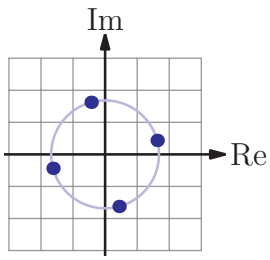
$3\text{cis}\left(\dfrac{-\pi}{8}\right), 3\text{cis}\left(\dfrac{-5\pi}{8}\right)$

6. (a) $8e^{\text{i}\frac{\pi}{3}}$

(b) $8^{\frac{1}{4}}e^{\text{i}\frac{\pi}{12}}, 8^{\frac{1}{4}}e^{\text{i}\frac{7\pi}{12}}$,

$8^{\frac{1}{4}}e^{\text{i}\frac{13\pi}{12}}, 8^{\frac{1}{4}}e^{\text{i}\frac{19\pi}{12}}$

(c)



7. (a) $\sqrt{2}\pm\sqrt{2}\text{i}, -\sqrt{2}\pm\sqrt{2}\text{i}$

(b) $\left(z^2+2\sqrt{2}z+4\right)$

$\left(z^2-2\sqrt{2}z+4\right)$

ANSWER HINT (7)

$(1+w_1+w_2+w_3+w_4+w_5)\times w$

9. a^2+b^2-ab

10. (a) $-1, e^{\frac{\text{i}\pi}{3}}, e^{-\frac{\text{i}\pi}{3}}$

(b) $x^3+6x^2+12x+8$

(c) $-3, -\dfrac{3}{2}\pm\dfrac{\sqrt{3}}{2}\text{i}$

Exercise 15I

1. $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$

2. (a) $\cos^4\theta - 6\cos^2\theta\sin^2\theta + \sin^4\theta$

(b) $\cos 4\theta = 8\cos^4\theta - 8\cos^2\theta + 1$

3. (b) $A=2, B=10, C=20$

4. (b) $(z+z^{-1})^6 = z^6+6z^4+1$

$5z^2+20+15z^{-2}+6z^{-4}+z^{-6}$

$(z-z^{-1})^6 = z^6-6z^4+$

$15z^2-20+15z^{-2}-6z^{-4}+z^{-6}$

5. (a) $\text{Re}: \cos^5\theta$

$-10\cos^3\theta$

$\text{Im}: 5\cos^4\theta\sin\theta - 10\cos^2\theta$

$\sin^3\theta + \sin^5\theta$

(c) 5

Mixed examination practice 15

Short questions

1. $-\dfrac{\sqrt{3}}{2}+\dfrac{7}{2}\text{i}$

2. $w=5\text{i}$, $z=3+2\text{i}$

3. $a=-3, b=7, c=-5$

4. $-2-\dfrac{3}{8}\text{i}$

5. $-\dfrac{1}{64}$

6. $a=-9$, $b=33$

8. 64i

9. $\dfrac{1}{\sqrt{3}}$

10. (a) $w=\text{i}z$

11. 2

12. 5

13. (a) -6

(b) -1

14. (b) $x^2+301x+8=0$

16. $\tan\theta$

17. $\dfrac{1}{2}$

Long questions

1. (a) $z_1 = \sqrt{2}\left(\cos\left(-\frac{\pi}{6}\right)+\mathrm{i}\sin\left(-\frac{\pi}{6}\right)\right)$

$z_2 = \sqrt{2}\left(\cos\left(-\frac{\pi}{4}\right)+\mathrm{i}\sin\left(-\frac{\pi}{4}\right)\right)$

(c) $\cos\frac{\pi}{12}=\frac{\sqrt{6}+\sqrt{2}}{4}$, $\sin\frac{\pi}{12}=\frac{\sqrt{6}-\sqrt{2}}{4}$

2. (a) $\cos\left(-\frac{\pi}{6}\right)+\mathrm{i}\sin\left(-\frac{\pi}{6}\right)$

(b) $c=1$

(c) $m=-6,\ n=4$

3. (a) (i) $Z^3\cos^3\theta-3\cos\theta\sin^2\theta+(3\cos^2\theta\sin\theta-\sin^3\theta)\mathrm{i}$

(c) $\frac{23\sqrt{2}}{20}$

5. (a) (i) $x_1+x_2+x_3=-\frac{b}{a}, x_1+x_2+x_3=-\frac{d}{a}$

6. (c) (ii) $\frac{2}{3}\pm\frac{\sqrt{5}}{3}\mathrm{i},\ \frac{-1}{2}\pm\frac{\sqrt{3}}{2}\mathrm{i}$

7. (a) $\omega^2=\mathrm{e}^{\frac{4\pi}{5}\mathrm{i}}, \omega^3=\mathrm{e}^{-\frac{4\pi}{5}\mathrm{i}}, \omega^4=\mathrm{e}^{-\frac{2\pi}{5}\mathrm{i}}$

(c) $4\cos^2\left(\frac{2\pi}{5}\right)+2\cos\left(\frac{2\pi}{5}\right)-1=0$

8. (a) $\cos3\theta=4\cos^3\theta-3\cos\theta$

$\sin3\theta=3\sin\theta-4\sin^3\theta$

(f) $2-\sqrt{3}$

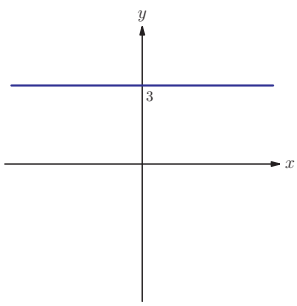
9. (b) (i) a (ii) $b(\cos\theta+\mathrm{i}\sin\theta)$

(iii) $AB=\sqrt{b^2\sin^2\theta+(a-b\cos\theta)^2}$

Chapter 16

Exercise 16A

1. (a) (i)



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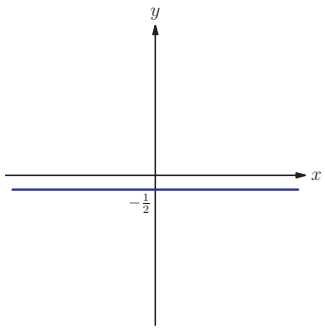
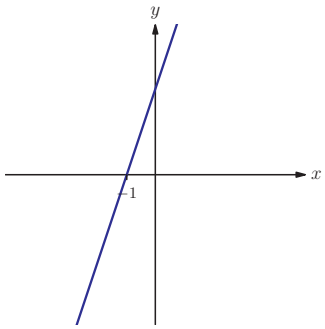


(b) (i)



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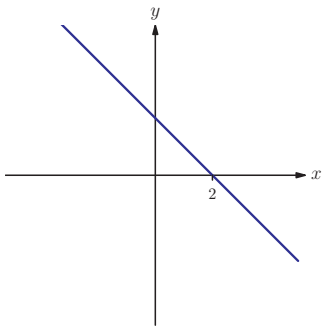
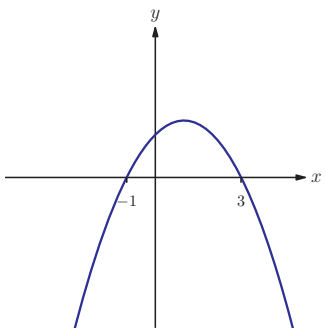


(c) (i)



(ii)