

Mathematics Pre-arrival course

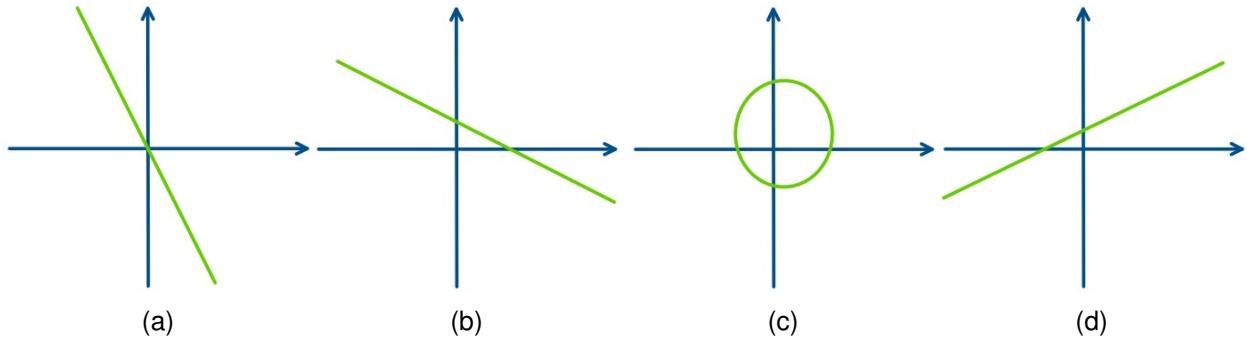
Weekly Quiz 4 – Complex Numbers

1. Which of the following is equal to i^{103} :
 - (a) i
 - (b) -1
 - (c) $-i$
 - (d) 1
2. Given that the quadratic equation $z^2 + az + b$, has a complex root equal to $2 - 3i$ and a and b are real numbers. Find a :
 - (a) 4
 - (b) 25
 - (c) -4
 - (d) 6
3. What is the argument of $-3 + i\sqrt{3}$:
 - (a) $\frac{11\pi}{6}$
 - (b) $\frac{2\pi}{3}$
 - (c) $\frac{\pi}{6}$
 - (d) $\frac{5\pi}{6}$
4. Which of the following are solutions to $z^3 = 2$:
 - (a) $\sqrt[3]{2}$
 - (b) $-\frac{\sqrt[3]{2}}{2} + i\frac{\sqrt[3]{2}\sqrt{3}}{2}$
 - (c) $\frac{\sqrt[3]{2}}{2} + i\frac{\sqrt[3]{2}\sqrt{3}}{2}$
 - (d) $-\frac{\sqrt[3]{2}}{2} - i\frac{\sqrt[3]{2}}{2}$
5. Find all complex solutions to the following cubic: $3z^3 - 5z^2 - 10z - 6$:
 - (a) $z = 3, z = \pm 2\sqrt{2}i$
 - (b) $z = -3, z = \pm 2\sqrt{2}i$
 - (c) $z = 3, z = -\frac{2}{3} \pm \frac{\sqrt{2}}{3}i$
 - (d) $z = 3, z = \frac{2}{3} \pm \frac{\sqrt{2}}{3}i$
6. Find all complex solutions to $z^2 + z^* = 2z$:
 - (a) $z = 0$ and $\frac{\sqrt{3}}{\sqrt{2}} \pm i\frac{\sqrt{3}}{\sqrt{2}}$
 - (b) $z = 0, z = 1$ and $\frac{3}{2} \pm i\frac{\sqrt{3}}{2}$
 - (c) $z = 0, z = 1$ and $\frac{\sqrt{3}}{2} \pm i\frac{\sqrt{3}}{\sqrt{2}}$
 - (d) $z = 0$

7. Which of the following are true:

- (a) $\cos 4\theta = 8 \cos^4 \theta - 8 \cos^2 \theta + 1$
- (b) $\cos 4\theta = 8 \cos^4 \theta + 8 \cos^2 \theta + 1$
- (c) $\cos 4\theta = 4 \cos^3 \theta \sin \theta - 4 \cos \theta \sin^3 \theta$
- (d) $\cos 4\theta = \cos^4 \theta - 6 \cos^2 \theta \sin^2 \theta + \sin^4 \theta$

8. Which of the following (in green) is a sketch of the loci $|z + 1| = |z - 2i|$:



9. Let $\arg(\frac{z+1}{z-1}) = \frac{\pi}{2}$ and $z^* = -z$. Select all possibilities for z :

- (a) $z = \frac{1}{\sqrt{2}} + i \frac{1}{\sqrt{2}}$
- (b) $z = i$
- (c) $z = i \frac{1}{\sqrt{2}}$
- (d) $z = -i$