



2018 Year 11 math topic test: Complex numbers © itute 2018

Q1 Express in terms of i in simplest form.

a. $\sqrt{-108}$ 1 mark

b. $(1 + \sqrt{-18})(1 - \sqrt{-18})$ 2 marks

c. i^{-2019} 1 mark

d. $\frac{i^{-1}}{1 + i^{-1}}$ 2 marks

e. $-\sqrt{5}(\sqrt{-5} - \sqrt{10})$ 2 marks

f. $\frac{1+i}{i(i-1)} - 1$ 2 marks

g. $\frac{i\operatorname{Re}(\bar{z}) - \operatorname{Im}(\bar{z})}{\operatorname{Re}(z) - i\operatorname{Im}(z)}$ where $\operatorname{Re}(z) \neq 0$ and $\operatorname{Im}(z) \neq 0$ 3 marks



Q2 Find the real values of a and b such that $(a - 5i)(5 + bi) = 50$.

3 marks

Q3 Find the real values of a and b such that $(\sqrt{2} - i)^3 = a + bi$.

3 marks

Q4 Find the real values of a and b such that $a + bi = \sqrt{-i}$.

3 marks

Q5 Find the real values of a and b such that $\frac{a^2 + b^2}{a + bi} = 1$

3 marks



Q6 Express each of the following complex numbers in the form $r \operatorname{cis} \theta$ where $r = |z|$ and $\theta = \operatorname{Arg}(z)$.

a. $\sqrt{3} - i$ 2 marks

b. $\frac{-2i}{\sqrt{2} - i\sqrt{2}}$ 3 marks

c. $\frac{\sqrt{3} \operatorname{cis}(\pi)}{2 \operatorname{cis}(2\pi)}$ 2 marks

d. $-i \operatorname{cis} \frac{5\pi}{3}$ 3 marks

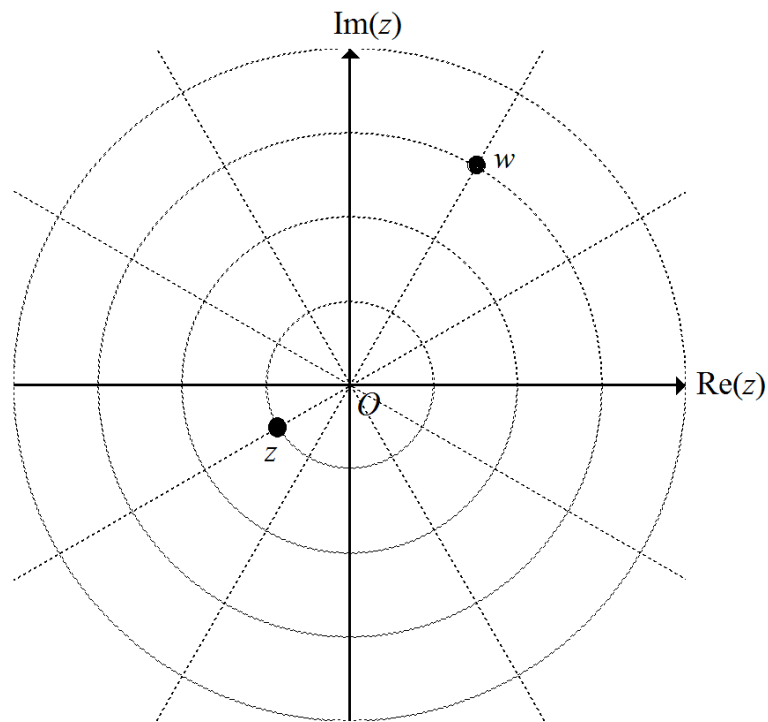
Q7 Solve the following equations over \mathbb{C} .

a. $z^3 + z^2 + z + 1 = 0$ 2 marks

b. $z^3 + 1 = 0$ 3 marks



Q8 Two complex numbers w and z are shown in Argand diagram below.



On the above diagram, mark down each of the following complex numbers.

- | | |
|-------------------------|---------|
| a. $h, h = w + z$ | 2 marks |
| b. $k, k = w - z$ | 2 marks |
| c. $p, p = wz$ | 2 marks |
| d. $q, q = \frac{w}{z}$ | 2 marks |
| e. $r, r = \bar{i}w$ | 2 marks |