

COMPLEX NUMBERS (Q 4, PAPER 1)

LESSON NO. 2: POWERS OF i

2006

4 (b) (ii) Write in its simplest form $i(i^4 + i^5 + i^6)$.

SOLUTION

$$\begin{aligned}i(i^4 + i^5 + i^6) \\&= i^5 + i^6 + i^7 \\&= i + i^2 + i^3 \\&= i - 1 - i = -1\end{aligned}$$

Powers of i

$$\begin{aligned}i &= \sqrt{-1} = i \\i^2 &= -1 \\i^3 &= -i \\i^4 &= 1\end{aligned}$$

$i^{\text{power}} = i^{\text{remainder}}$ when power is divided by 4

When you see a power of i , divide the power by 4 and take the remainder. Now use the table on the left to write your answer.

Powers of i repeat in groups of four. You always get one of 4 answers: $i, -1, -i, 1$

2003

4 (a) Given that $i^2 = -1$, find the value of:

(i) i^8

(ii) i^7 .

SOLUTION

Powers of i

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4 (a) (i)

$$i^8 = i^0 = 1$$

4 (a) (ii)

$$i^7 = i^3 = -i$$

1998

- 4 (a) Let $w = 2i$, where $i^2 = -1$. Plot
- (i) w^2 ,
 - (ii) w^3
- on an Argand diagram.

SOLUTION

4 (a) (i)

$$w^2 = (2i)^2 = 4i^2 = -4 = -4 + 0i$$

4 (a) (ii)

$$w^3 = (2i)^3 = 8i^3 = -8i = 0 - 8i$$

Powers of i

$$i = \sqrt{-1} = i$$

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

