

## Questions from Homework

$$\textcircled{1} b) i^7 + i^{23} + i^{94} + i^{112}$$

$$(i^4 \cdot i^3) + (i^{20} \cdot i^3) + (i^{92} \cdot i^2) + (1)$$

$$-i + (-i) + (-1) + 1$$

$$\boxed{-2i}$$

$$c) (\sqrt{-16})(\sqrt{-49})(\sqrt{-27})(\sqrt{-12})$$

$$(4i)(7i)(3i\sqrt{3})(2i\sqrt{3}) \rightarrow 504i^4$$

$$(28i^2)(6i^2(3)) \rightarrow \boxed{504}$$

$$(28i^2)(18i^2)$$

$$504(i^4)$$

$$\boxed{504}$$

$$\textcircled{1} d) i^{-5} + i^{-11} + i^{-18} + i^{-196}$$

$$(i^{-4} \cdot i^{-1}) + (i^{-8} \cdot i^{-3}) + (i^{-16} \cdot i^{-2}) + (1)$$

$$-i + i - 1 + 1$$

$$\boxed{0}$$

Number	"a"	"b"	O.P.	Modulus
④ $-2+5i$	$-2$	$5$	$(-2, 5)$	$\sqrt{29}$
$\sqrt{7}-\sqrt{-36}$ $= \sqrt{7}-6i$	$\sqrt{7}$	$-6$	$(\sqrt{7}, -6)$	$\sqrt{43}$

③  $z = 5-11i$

a)  $\bar{z} = 5+11i$

b)  $5-11i + (5+11i)$   
 $= 10$

c)  $5-11i - (5+11i)$   
 $5-11i-5-11i$   
 $= -22i$

### Positive Powers of "i"

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

### Negative Powers of "i"

$$i^{-1} = -i$$

$$i^{-2} = -1$$

$$i^{-3} = i$$

$$i^{-4} = 1$$

### Notice a pattern?

For positive powers take out the largest multiple of 4

For negative powers take out the largest multiple of -4

## Examples

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = -i$$

$$i^4 = 1$$

$$i^{-1} = -i$$

$$i^{-2} = -1$$

$$i^{-3} = i$$

$$i^{-4} = 1$$

$$i^8 + i^{33} + i^{83} - i^{132}$$

$$(1) + (i) + (-i) - (1)$$

$$\boxed{0}$$

$$i^{-9} + i^{-28} + i^{-83} - i^{-129}$$

$$(i^{-8} \cdot i^{-1}) + (1) + (i^{-80} \cdot i^{-3}) - (i^{-128} \cdot i^{-1})$$

$$(-i) + (1) + (i) - (-i)$$

$$\boxed{1+i}$$

$$(2+i)^2 - (3i)^3 + 7i$$

$$4 + 4i + \underline{i^2} - 27\underline{i^3} + 7i$$

$$4 + 11i + (-1) - 27(-i)$$

$$4 + 11i - 1 + 27i$$

$$\boxed{3 + 38i}$$

Simplify the following!

$$\frac{(2+3i)(3-i)}{(1-5i)(2+4i)}$$

$$\frac{6+7i-3(i^2)}{2-6i-20(i^2)}$$

$$\frac{(9+7i)(22+6i)}{(22-6i)(22+6i)}$$

$$\frac{198+54i+154i+42(i^2)}{484-36(i^2)}$$

$$\frac{198+208i-42}{484+36}$$

$$\frac{156+208i}{520}$$

$$\frac{156}{520} + \frac{208i}{520}$$

$$\boxed{\frac{3}{10} + \frac{2i}{5}}$$

## Review # 1

$$\textcircled{1} \text{ c) } \frac{(7-5i)(2-3i)}{(2+3i)(2-3i)}$$

$$\frac{14-21i-10i+15i^2}{4-9i^2}$$

$$\frac{14-31i-15}{4+9}$$

$$\frac{-1-31i}{13} \quad \text{or} \quad -\frac{1}{13} - \frac{31i}{13}$$

## Small Sheet

$$\textcircled{5} \text{ c) } \frac{\cancel{3x}(x+2)}{3x} \cdot \frac{x-2}{x+2} = \frac{x-4}{x+2} \quad \text{LCD} = 3x(x+2)$$

$$(x-2)(x+2) = 3x(x-4)$$

$$x^2 - 4 = 3x^2 - 12x$$

$$0 = 2x^2 - 12x + 4$$

$$a=2 \quad b=-12 \quad c=4$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{12 \pm \sqrt{144 - 32}}{4}$$

$$= \frac{12 \pm \sqrt{112}}{4}$$

$$= \frac{12 \pm \sqrt{16 \cdot 7}}{4}$$

$$= \frac{12 \pm 4\sqrt{7}}{4}$$

$$= \boxed{3 \pm \sqrt{7}}$$

$$\textcircled{1} \text{ es } \frac{(5+i)(4-3i)}{(2-5i)(1-i)}$$

$$\frac{20 - 11i - 3i^2}{2 - 7i + 5i^2}$$

$$\frac{(23 - 11i)(-3+7i)}{(-3-7i)(-3+7i)}$$

$$\frac{-69 + 161i + 33i - 7i^2}{9 - 49i^2}$$

$$\frac{8 + 194i}{58}$$

$$\frac{8}{58} + \frac{194i}{58}$$

$$\frac{4}{29} + \frac{97i}{29}$$

Number	"a"	"b"	ordered pair	Modulus
$\sqrt{121} + \sqrt{-16}$				
$\underline{11} + \underline{4}i$	11	4	(11, 4)	$\sqrt{137}$
4	4	0	(4, 0)	4

If  $z = -3 + 2i$

find  $\bar{z} = -3 - 2i$



$$\textcircled{1} f) \frac{(-1+2i)(5-4i)}{(1-2i)(5+4i)}$$

$$\frac{-5 + 14i - 8i^2}{5 - 6i - 8i^2}$$

$$\frac{(3 + 14i)(13 + 6i)}{(13 - 6i)(13 + 6i)}$$

$$\frac{39 + 18i + 182i + 84i^2}{169 - 36i^2}$$

$$\frac{-45 + 200i}{205}$$

$$\frac{-45}{205} + \frac{200i}{205}$$

$$\frac{-9}{41} + \frac{40i}{41}$$

$$\textcircled{a} \text{ b) } i^{-3} - i^{-20}$$

$$i - 1$$

$$\text{d) } i^{-10} - i^{-28} + i^{130} - i^2$$

$$(i^{-8} \cdot i^{-2}) - (1) + (i^{128} \cdot i^2) - (-1)$$

$$((1)(-1)) - 1 + ((1)(-1)) + 1$$

$$-1 - 1 - 1 + 1$$

$$-2$$

$$\textcircled{a} \text{ e) } i^5 + i^{29} + i^{89} - i^{-31}$$

$$(i^4)(i^1) + (i^{28})(i^1) + (i^{88})(i^1) - (i^{-28})(i^{-3})$$

$$i + i + i - i$$

$$2i$$

$$\textcircled{4} \text{ b) } \sqrt{5} - \sqrt{49} \longrightarrow a + bi$$

$$\underline{\sqrt{5}} - \underline{7}i$$

$$a = \sqrt{5}$$

$$b = -7$$

$$(\sqrt{5}, -7)$$

$$|z| = \sqrt{a^2 + b^2}$$

$$= \sqrt{(\sqrt{5})^2 + (-7)^2}$$

$$= \sqrt{5 + 49}$$

$$= \sqrt{54}$$

$$= \sqrt{9 \cdot 6}$$

$$= 3\sqrt{6}$$

Quiz:

① If  $z = 3 + i\sqrt{5}$

a) Find  $\bar{z} = 3 - i\sqrt{5}$

b) Find  $z + \bar{z}$   
 $3 + i\sqrt{5} + (3 - i\sqrt{5})$   
 $3 + i\sqrt{5} + 3 - i\sqrt{5}$   
 $6$

c)  $z \cdot \bar{z}$   
 $(3 + i\sqrt{5})(3 - i\sqrt{5})$   
 $9 - 3i\sqrt{5} + 3i\sqrt{5} - i^2(5)$   
 $9 - 5(-1)$   
 $9 + 5$   
 $14$

② Calculate the modulus

a)  $-3 + 5i\sqrt{5}$   
 $a = -3$   $b = 5\sqrt{5}$

$$|z| = \sqrt{a^2 + b^2}$$
$$= \sqrt{(-3)^2 + (5\sqrt{5})^2}$$
$$= \sqrt{9 + 50}$$
$$= \sqrt{59}$$

③ Solve for  $x$ :

$$2x^2 - x + 3 = 0$$

$a = 2$   $b = -1$   $c = 3$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(3)}}{2(2)}$$

$$x = \frac{1 \pm \sqrt{1 - 24}}{4}$$

$$x = \frac{1 \pm \sqrt{-23}}{4}$$

$$x = \frac{1 \pm \sqrt{23}i}{4}$$

$$x = \frac{1 \pm i\sqrt{23}}{4}$$

$$x = \frac{1}{4} \pm \frac{i\sqrt{23}}{4}$$

$$\begin{aligned}
& \textcircled{4} \quad 6(1+i)^2 - 5i^{26} + i^{-31} \\
& \quad 6(1+i)(1+i) - 5(i^{24})(i^2) + (i^{-28})(i^{-3}) \\
& \quad 6(1+i+i+i^2) - 5(1)(-1) + (1)(i) \\
& \quad 6(1+2i+(-1)) + 5 + i \\
& \quad 6(2i) + 5 + i \\
& \quad 12i + 5 + i \\
& \quad \boxed{5 + 13i}
\end{aligned}$$