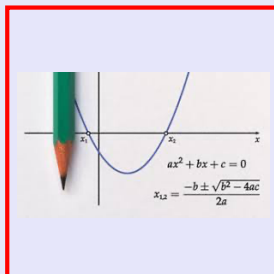


Math 125

Spring 2022

Lecture 21



Simplify:

$$1) \sqrt{-100} = \sqrt{100} \sqrt{-1} = 10i = \boxed{10i}$$

$a + bi$

Re. Part = 0

Im. Part = 10

$$2) \sqrt{50} - 2\sqrt{-40} = \sqrt{25}\sqrt{2} - 2\sqrt{4}\sqrt{10}\sqrt{-1}$$

$$= 5\sqrt{2} - 2 \cdot 2\sqrt{10}i = \boxed{5\sqrt{2} - 4\sqrt{10}i}$$

Re. Part = $5\sqrt{2}$

Im. Part = $-4\sqrt{10}$

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

$$\boxed{6} - \boxed{4i} - \boxed{12} + \boxed{8i} = \boxed{-6 + 4i}$$

Re. Part = -6

Im. Part = 4

$$4) (5 - 3i)(2 + 5i)$$

$$= 10 + 25i - 6i - 15i^2 = 10 + 19i - 15(-1) = 10 + 19i + 15$$

$$= \boxed{25 + 19i}$$

Re. $\rightarrow 25$

Im. $\rightarrow 19$

$$5) (-3 + 4i)(-3 - 4i)$$

$$= 9 + 12i - 12i - 16i^2$$

$$= 9 - 16(-1) = 9 + 16$$

$$= \boxed{25} \quad \text{Im.} \rightarrow 0$$

How to divide Complex numbers:

Multiply numerator and denominator by the complex conjugate of the denominator, simplify, and final answer in $a + bi$ form.

$$\begin{aligned} \frac{5}{2-i} &= \frac{5(2+i)}{(2-i)(2+i)} = \frac{10 + 5i}{4 + \cancel{2i} - \cancel{2i} - i^2} \\ &= \frac{10 + 5i}{4 - (-1)} = \frac{10 + 5i}{5} \\ &= \frac{10}{5} + \frac{5i}{5} = \boxed{2+i} \\ &\text{Re. } \rightarrow 2 \\ &\text{Im. } \rightarrow 1 \end{aligned}$$

$$\begin{aligned} \frac{5i}{1+2i} &= \frac{5i(1-2i)}{(1+2i)(1-2i)} \\ &= \frac{5i - 10i^2}{1 - \cancel{2i} + \cancel{2i} - 4i^2} \\ &= \frac{5i - 10(-1)}{1 - 4(-1)} = \frac{5i + 10}{1 + 4} = \frac{5i + 10}{5} \\ &= \frac{5i}{5} + \frac{10}{5} = i + 2 = \boxed{2+i} \end{aligned}$$

$a + bi$
form

$$ix = x$$

Re. $\rightarrow 2$

Im. $\rightarrow 1$

$$\text{Divide : } \frac{1+i}{3-2i}$$

$$\frac{1+i}{3-2i} = \frac{(1+i)(3+2i)}{(3-2i)(3+2i)} = \frac{3+2i+3i+2i^2}{9+\cancel{6i}-\cancel{6i}-4i^2}$$

$$= \frac{3+5i+2(-1)}{9-4(-1)} = \frac{1+5i}{13} = \boxed{\frac{1}{13} + \frac{5}{13}i}$$

a+bi Form

$$\text{Re.} \rightarrow 1/13$$

$$\text{Im.} \rightarrow 5/13$$

$$\text{Divide: } \frac{3-4i}{3+4i}$$

$$\frac{3-4i}{3+4i} = \frac{(3-4i)(3-4i)}{(3+4i)(3-4i)} = \frac{9 - 12i - 12i + 16i^2}{9 - 12i + 12i - 16i^2}$$

$$= \frac{9-24i+16(-1)}{9-16(-1)} = \frac{-7-24i}{25} = \boxed{\frac{-7}{25} - \frac{24}{25}i}$$

$$\text{Re.} \rightarrow \frac{-7}{25}$$

$$\text{Im.} \rightarrow \frac{-24}{25}$$

Simplify

$$i^{80} = (i^2)^{40} = (-1)^{40} = \boxed{1}$$

$$(-1)^{\text{even}} = 1$$

$$(-1)^{\text{odd}} = -1$$

$$i^{85} = i^{84} \cdot i = (i^2)^{42} i = (-1)^{42} \cdot i = 1 \cdot i = \boxed{i}$$

$$i^{74} = (i^2)^{37} = (-1)^{37} = \boxed{-1}$$

$$i^{91} = i^{90} \cdot i = (i^2)^{45} i = (-1)^{45} \cdot i = -1 \cdot i = \boxed{-i}$$

Simplify₃

$$(2+i)^3 = (2+i)(2+i)(2+i)$$

$$= (2+i)(4+2i+2i+i^2)$$

$$= (2+i)(4+4i-1)$$

$$= (2+i)(3+4i)$$

$$= 6+8i+3i+4i^2$$

$$= 6+11i+4(-1)$$

$$= 6+11i-4$$

$$= \boxed{2+11i}$$

Re. \rightarrow 2Im. \rightarrow 11

Simplify

$$(2 - 3i)(2 + 3i)(3 - 4i)(3 + 4i)$$

$$= (4 + \cancel{6i} - \cancel{6i} - 9i^2)(9 + \cancel{12i} - \cancel{12i} - 16i^2)$$

$$= (4 - 9(-1))(9 - 16(-1))$$

$$= 13 \cdot 25 = \boxed{325}$$

Work on other
Study Guides

SG 15

QUIZ on
Tuesday
at 8:50 AM

Be aware
of due dates
for SG 15.