10.7 p.655

Defn. $\sqrt{-1} = i$, the imaginary #

ex8 $\sqrt{-225} = \sqrt{-1}\sqrt{225}$

$= i \cdot 15$

$= 15i$

ex10 $-\sqrt{-196}$

$-\sqrt{-1}\sqrt{196}$

$-i \cdot 14$

$-14i$

ex12 $\sqrt{-21}$

$\sqrt{-1}\sqrt{21}$

$i\sqrt{21}$

or

$\sqrt{21}i$

$\sqrt{21}\,i$

ex 14 $\sqrt{-96}$

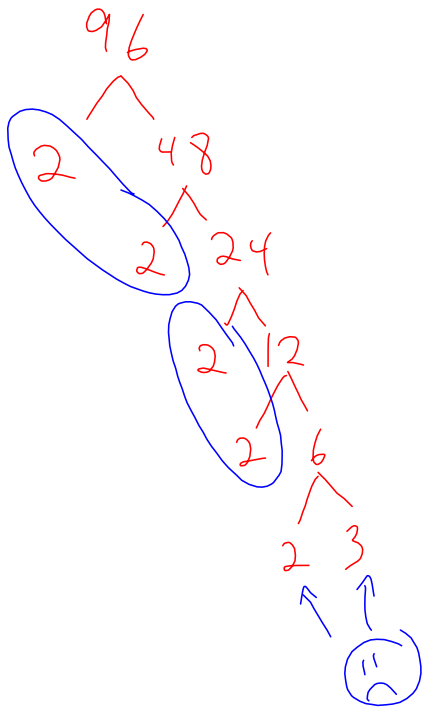
$\sqrt{-1}\sqrt{96}$

$i \cdot 2 \cdot 2 \cdot \sqrt{2 \cdot 3}$

$4i\sqrt{6}$

or

$4\sqrt{6}\,i$



ex 16 $\sqrt{-3} \cdot \sqrt{-19}$

$\sqrt{-1} \cdot \sqrt{3} \cdot \sqrt{-1} \cdot \sqrt{19}$

$i \cdot \sqrt{3} \cdot i \cdot \sqrt{19}$

$i^2 \cdot \sqrt{57}$

$-1 \cdot \sqrt{57}$ or $-\sqrt{57}$

Defn

$\sqrt{-1} = i$

$-1 = i^2$

ex like #18

$\sqrt{-4} \cdot \sqrt{-9}$

$\sqrt{-1} \cdot \sqrt{4} \cdot \sqrt{-1} \cdot \sqrt{9}$

$i \cdot 2 \cdot i \cdot 3$

$6i^2$

$6(-1)$

-6

ex 20 $\sqrt{-10} \cdot \sqrt{2}$

$\sqrt{-1} \cdot \sqrt{10} \cdot \sqrt{2}$

$i \cdot \sqrt{10} \cdot \sqrt{2}$

$i \cdot \sqrt{20}$

$i \cdot \sqrt{4} \cdot \sqrt{5}$

$i \cdot 2\sqrt{5}$ or $2i\sqrt{5}$ or $2\sqrt{5}\,i$

ex 22

$$\frac{\sqrt{-40}}{\sqrt{-10}} = \frac{\sqrt{-1}\cdot\sqrt{4}\sqrt{10}}{\sqrt{-1}\cdot\sqrt{10}} = \frac{i\cdot 2\sqrt{10}}{i\sqrt{10}}$$

$$\sqrt{\frac{-40}{-10}} = \sqrt{4} = 2 \qquad = \frac{2i\sqrt{10}}{i\sqrt{10}} = 2$$

ex 24

$$\frac{\sqrt{-160}}{\sqrt{10}} = \sqrt{\frac{-160}{10}} = \sqrt{-16} = 4i$$

$$\sqrt{-1}\sqrt{16}$$

ex 26

$$\frac{-\sqrt{-100}}{\sqrt{-25}} = -\sqrt{4} = -2$$

ex 30 $(7+15i)+(-11+14i)$

$= -4+29i$

Complex #s $a+bi$ a & b are real #s

ex 32 $(-2+6i)+(2-6i) = 0$

ex 34 $(9+i)-(3+2i)$

$= 9+i-3-2i$

$= 6-i$

IF

$6-i^2$

$6-(-1)$

$6+1$

7

ex 36 $(-2-3i)-(-5-3i)$

$= -2-3i+5+3i$

$= 3$

ex 38

$(-1+i)+(2+5i)+(3+2i) = 4+8i$

ex 40

$[(7+2i)+(-4-i)]-(2+5i)$

$= 3+i-2-5i$

$= 1-4i$

ex 44 $(5i)(125i) = 625i^2 = 625(-1)$

$= -625$

ex 46 $(-32i)(-2i) = 64i^2 = 64(-1) = -64$

ex 48 $3i(4+9i) = 12i+27i^2$

$= 12i+27(-1)$

$= 12i-27 = -27+12i$

ex 3

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

$21 + 7i - 6i - 2i^2$

$21 + i - 2(-1)$

$21 + i + 2$

$23 + i$

ex 4

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

$= 3i(-3-i)(-3-i)$

$= 3i(9 + 3i + 3i + i^2)$

$= 3i(9 + 6i - 1)$

$= 3i(8 + 6i) = 24i + 18i^2$

$= 24i + 18(-1)$

$= 24i - 18$ $\quad -18 + 24i$

ex58

$(7+2\sqrt{-1})(7-2\sqrt{-1})$

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

Conjugates!

F ~~O~~ ~~I~~ L

$49 - 14i + 14i - 4i^2$ ... $-4(-1)$

$49 + 4$

53

ex60

$\left(\frac{(2-i)(2+i)}{(2-i)(2+i)}\right)^2$

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

$2 \cdot 57 \cdot 5 \cdot 12$

$2 \cdot 5 \cdot 57 \cdot 12$

$(2-i)(2-i)(2+i)(2+i)$

$(2-i)(2+i)(2-i)(2+i)$

$4 - i^2 \quad \cdot \quad 5$

$4 - (-1) \quad \cdot 5$

$5 \quad \cdot 5$

25

ex 64

$$\frac{2}{1+i} \cdot \frac{1-i}{1-i} = \frac{2-2i}{1-i^2}$$

$$= \frac{2-2i}{1-(-1)} = \frac{2-2i}{2}$$

$$= 1-i$$

about a week ago F L

$$\frac{2}{1+\sqrt{2}} \cdot \frac{1-\sqrt{2}}{1-\sqrt{2}}$$

$$= \frac{2-2\sqrt{2}}{1-2} = \frac{2-2\sqrt{2}}{-1}$$

$$= -2+2\sqrt{2}$$

ex 66

$$\frac{-8i}{1+i} \cdot \frac{1-i}{1-i} = \frac{-8i+8i^2}{1-i^2}$$

$$= \frac{-8i+8(-1)}{1-(-1)} = \frac{-8i-8}{2} = -4-4i$$

ex 68

$$\frac{-38-8i}{7+3i} \cdot \frac{7-3i}{7-3i}$$

$$= \frac{-266 + 114i - 56i + 24i^2}{49 - 9i^2 + 9}$$

$$= \frac{-290 + 58i}{58} = -5 + i$$

ex 72

$$\frac{5-i}{0+1} \cdot \frac{i}{i} = \frac{5i - i^2}{i^2} = \frac{5i+1}{-1}$$

$$= -1 - 5i$$

$$\frac{5-i}{i} \cdot \frac{-i}{-i} = \frac{-5i + i^2}{-i^2} = \frac{-1 - 5i}{1}$$

ex 76 i^{26}

$i^{26} = i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^2$

$= 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot (-1)$

$= -1$

$4\overline{)26}$ 6 R 2

$i^{26} = i^2$

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

$= i \cdot (-1)$

$= -i$

$i^4 = i^2 \cdot i^2$

$= (-1)(-1)$

$= 1$

# R 0	# R 1	# R 2	# R 3
i^0	i^1	i^2	i^3
			$(i^2)(i)$
1	i	-1	$-1\,i$
			$-i$

ex 78 i^{48} $4\overline{)48}$ no R 0 $i^0 = 1$

ex 80 i^{102} $4\overline{)102}$ mm R 2 $i^2 = -1$

ex 82 i^{83} $4\overline{)83}$ R 3 $i^3 = -i$

ex 84 $i^{-17} = \frac{1}{i^{17}}$ $4\overline{)17}$ R 1 $\frac{1}{i} \cdot \frac{-i}{-i} = \frac{-i}{-i^2} = \frac{-i}{1}$

i ✓

$i^2 = -1$ ✓

$i^3 = i^2 \cdot i = -i$ ✓

$i^4 = i^2 \cdot i^2 = (-1)(-1) = 1$ ✓

$i^5 = i^4 \cdot i = 1 \cdot i = i$

ex 88

$$I = \frac{E}{R + (X_L - X_C)i}$$

Find E if $I = 1 - i$, $R = 2$, $X_L = 3$, $X_C = 1$

$$1 - i = \frac{E}{2 + (3 - 1)i}$$

$$(2+2i)(1-i) = \frac{E}{2+2i}\left(\frac{2+2i}{1}\right)$$

$$2 - 2i + 2i - 2i^2 = E$$

$$2 + 2 = E$$

$$4 = E$$