10.7
p. 710

Test will have 4 Ps from this section like #s 54–86

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

then, $(\sqrt{-1})^2 = (i)^2$

$-1 = i^2$ ← we'll need this when we simplify expressions

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ex 8

$-\sqrt{-1}$

$-i = -i$

ex 10

$-i^2 = -1 \cdot i^2$

$= -1 \cdot -1$

$= (-1)(-1)$

$= 1$

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ex 12

$(-i)^2$

$= (-1i)^2$

$= (-1i)(-1i)$

$= i^2$

$= -1$

ex 14

$\sqrt{-225}$

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

$= i \cdot 15$

$= 15i$

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ex 16 $-\sqrt{-196}$

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

$= -i \cdot 14$

$= -14i$

ex 18 $\sqrt{-21}$

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

$= i \cdot \sqrt{21}$

$i\sqrt{21}$ or $\sqrt{21}\,i$ or $\sqrt{21}\,i$

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ex 22 $\sqrt{-3} \cdot \sqrt{-19}$

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

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

$= i^2 \cdot \sqrt{3} \cdot \sqrt{19}$

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

$-\sqrt{57}$

ex 28 $\dfrac{\sqrt{-40}}{\sqrt{-10}} = \dfrac{\sqrt{-1}\sqrt{40}}{\sqrt{-1}\sqrt{10}}$

$= \dfrac{\sqrt{40}}{\sqrt{10}} = \sqrt{\dfrac{40}{10}} = \sqrt{4}$

$= 2$

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ex 30 $\dfrac{\sqrt{-160}}{\sqrt{10}} = \dfrac{\sqrt{-1}\sqrt{160}}{\sqrt{10}} = i\sqrt{16} = i \cdot 4 = 4i$

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

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ex 32 $\dfrac{-\sqrt{-100}}{\sqrt{-25}} = -\sqrt{\dfrac{-100}{-25}} = -\sqrt{4} = -2$

$\dfrac{-\sqrt{-100}}{\sqrt{-25}} = \dfrac{-i\sqrt{100}}{i\sqrt{25}} = \dfrac{-i\sqrt{4}}{i} = -\sqrt{4} = -2$

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ex 34 $(7+15i)+(-11+14i) = -4+29i$

real part, imaginary part

Complex #s

however

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

$7+15i+11-14i = 18+i$

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ex 38 $(9+i)-(3+2i)$

$= 9+i-3-2i = 6-i$

ex 44 $[(7+2i)+(-4-i)]-(2+5i)$

$= 3+i-2-5i$

$= 1-4i$

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ex48 $(5i)(125i) = 625i^2$

$= 625(-1) = -625$

ex50 $(-32i)(-2i) = 64i^2 = 64(-1) = -64$

ex52 $3i(4+9i)$

$= 12i + 27i^2 = 12i + 27(-1) = 12i - 27$

$= -27 + 12i$

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ex54 $(7-2i)(3+i)$

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

$= 21 + i - 2(-1)$

$= 21 + i + 2$

$= 23 + i$

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ex 56 $(3+2i)^2$

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

$= 9 + 6i + 6i + 4i^2$

$4i^2$
$4(-1)$
-4

$= 9 + 12i - 4$

$= 5 + 12i$

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ex 62 $(7+2i)(7-2i)$ conjugates

$= 49 - 4i^2$

$-4(-1)$

$= 49 + 4$

$= 53$

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ex 64 $(2-i)^2(2+i)^2$

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

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

$4-i^2$

$4+1$

$5 \cdot 5 = 25$

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ex 70 Use Conjugates

$\frac{-8i}{1+i} \cdot \frac{1-i}{1-i}$

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

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

like 10.5

$\frac{-8}{1+\sqrt{2}} \cdot \frac{1-\sqrt{2}}{1-\sqrt{2}}$

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ex 72

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

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

$$= \frac{-266+58i-24}{49+9} = \frac{-290+58i}{58}$$

$$= -5+i$$

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ex 74

$$\frac{-1+5i}{3+2i} \cdot \frac{3-2i}{3-2i}$$

$$= \frac{-3+2i+15i-10i^2}{9-4i^2} = \frac{-3+17i+10}{9+4}$$

$$= \frac{7+17i}{13} = \frac{7}{13} + \frac{17}{13}i$$

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ex 76 $\frac{5-i}{i} \cdot \frac{i}{i} = \frac{5i - i^2}{i^2} = \frac{5i+1}{-1}$

$= -5i - 1$

$= -1 - 5i$

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

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$i^3 = i^2 \cdot i = -1 \cdot i = -i$ $4\overline{)3}$ 0R 3

$i^4 = (i^2)(i^2) = (-1)(-1) = 1$ $4\overline{)4}$ 1R0

$i^{13} = i^{12} \cdot i$ $4\overline{)13}$ 3R1

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

$= 1 \cdot 1 \cdot 1 \cdot i = i$

$i^{18} = i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^2$ $4\overline{)18}$ 4R2

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

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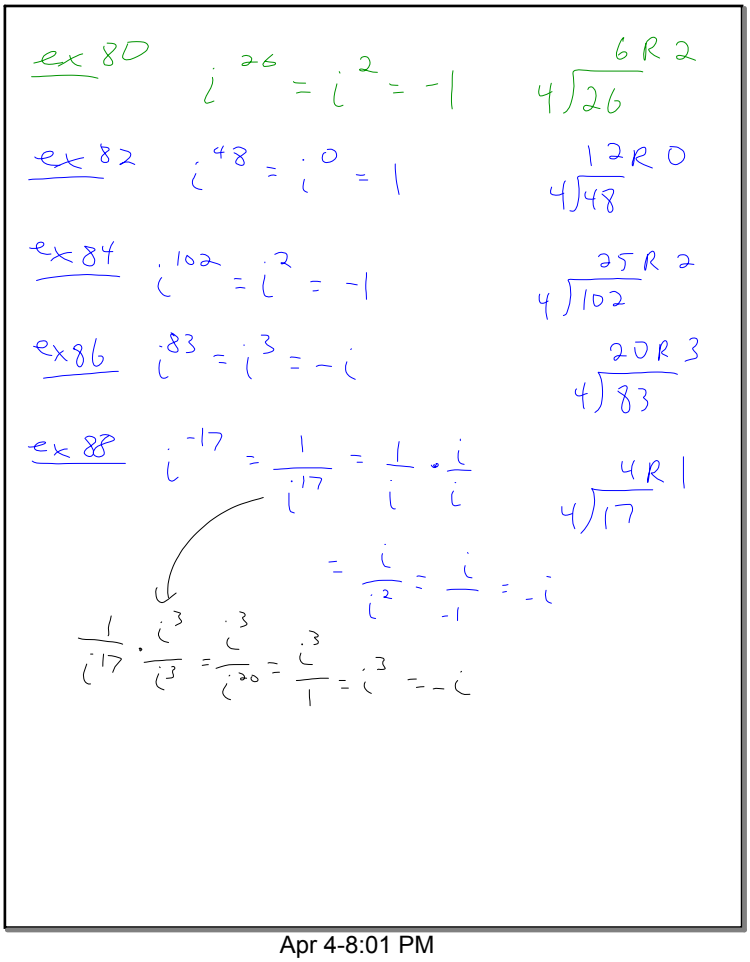
ex 80
$i^{26} = i^2 = -1$
$4\overline{)26}$ 6 R 2
ex 82
$i^{48} = i^0 = 1$
$4\overline{)48}$ 12 R 0
ex 84
$i^{102} = i^2 = -1$
$4\overline{)102}$ 25 R 2
ex 86
$i^{83} = i^3 = -i$
$4\overline{)83}$ 20 R 3
ex 88
$i^{-17} = \frac{1}{i^{17}} = \frac{1}{i} \cdot \frac{i}{i}$
$= \frac{i}{i^2} = \frac{i}{-1} = -i$
$4\overline{)17}$ 4 R 1
$\frac{1}{i^{17}} \cdot \frac{i^3}{i^3} = \frac{i^3}{i^{20}} = \frac{i^3}{1} = i^3 = -i$

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