

Complex Numbers

HERMAN®

by Jim Unger



"When I said 2 x 4 equals 5,
I meant after taxes!"

<http://www.taxguru.net/comix/herman2007034072931.jpg>

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

$$i^2 = -1$$

$a + bi$ → imaginary part
→ real part

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Write in the form $a + bi$:

1. $(-11 + 4i) + (6 + 8i)$

2. $(3 + \sqrt{-16}) + (2 + \sqrt{-25})$

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Write in the form $a + bi$:

1. $(\underline{-11} + \underline{4i}) + (\underline{6} + \underline{8i})$
 $= -5 + 12i$

2. $(3 + \sqrt{-16}) + (2 + \sqrt{-25})$
 $\quad \quad \quad \underline{4i} \quad \quad \quad \underline{5i}$
 $= 3 + 4i + 2 + 5i$
 $= 5 + 9i$

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3. $7i(2 - 5i)$

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

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3. $7i(2 - 5i)$
 $14i - 35i^2$
 $= 14i + 35$
 $= 35 + 14i$

4. $(-4 + i)(3 - 2i)$
 $= -12 + 8i + 3i - 2i^2$
 $= -10 + 11i$

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5. $(1 + \sqrt{-4})(3 - \sqrt{-16})$

6. $(a + bi)(a - bi)$

7. $(a + bi)^2$

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5. $(1 + \sqrt{-4})(3 - \sqrt{-16})$
 $= (1 + 2i)(3 - 4i)$
 $= 3 - 4i + 6i - 8i^2$ $\rightarrow = 11 + 2i$

6. $(a + bi)(a - bi)$
 $= a^2 - abi + abi - b^2i^2$
 $= a^2 + b^2$ Conjugate

7. $(a + bi)^2$
 $= a^2 + 2abi + b^2i^2$
 $= a^2 - b^2 + 2abi$
Real + imaginary

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$$8. \quad \frac{i}{2+i} \cdot \frac{2-i}{2-i} = \frac{2i-i^2}{4-i^2} = \frac{1+2i}{5} = \frac{1}{5} + \frac{2}{5}i$$

$$9. \quad \frac{5-3i}{4+3i} \cdot \frac{4-3i}{4-3i}$$

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$$8. \quad \frac{i}{2+i} \cdot \frac{2-i}{2-i} = \frac{2i-i^2}{4-i^2} = \frac{2i+1}{5} = \underbrace{\frac{1}{5}}_{\text{Real}} + \underbrace{\frac{2}{5}i}_{\text{imaginary}}$$

$$9. \quad \frac{5-3i}{4+3i} \cdot \frac{4-3i}{4-3i} = \frac{20-15i-12i+9i^2}{16-9i^2}$$

$$= \frac{11-27i}{25} = \frac{11}{25} - \frac{27}{25}i$$

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10. $\frac{\sqrt{2}}{3-2i}$

11. $\frac{4+i}{2-i\sqrt{3}}$

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10. $\frac{\sqrt{2}}{3-2i} \cdot \frac{3+2i}{3+2i} = \frac{3\sqrt{2}}{13} + \frac{2\sqrt{2}}{13}i$

11. $\frac{4+i}{2-i\sqrt{3}} \cdot \frac{2+i\sqrt{3}}{2+i\sqrt{3}} = \frac{8+2i+4i\sqrt{3}-\sqrt{3}}{4+3} =$
 $\frac{8-\sqrt{3}}{7} + \frac{2+i\sqrt{3}}{7}i$ $\frac{4+2i\sqrt{3}-2i\sqrt{3}-i^2\sqrt{9}}{4+3}$

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Homework: pp. 202 - 203:
4, 10
16 - 60 by 4's

Graded due Thursday!!

Oct 4-12:13 PM

Oct 1-11:14 AM