5.9 Complex Numbers

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

$\sqrt{-9} = \sqrt{9 \cdot -1} = \sqrt{9} \cdot \sqrt{-1} = 3i$

$2 + 3i$ Complex Number

$0 + 2i$

1. $(-4 + 2i) + (6 - 3i)$

$2 - i$

add the real part
add the imaginary part

$(3 + \sqrt{2}) + (6 - 3\sqrt{2})$

$9 - 2\sqrt{2}$

9. $(15 - 12i) + (11 - 13i)$

$26 - 25i$

6. $(5 + 2i) - (-6 - 3i)$

$5 + 2i + 6 + 3i$

$11 + 5i$

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

$2x + 3 - 4x + 5$

$-2x + 8$

$i^2 = -1$

10. i^4

$(i^2)^2$

$(-1)^2$

$\boxed{1}$

11. i^6

$(i^2)^3$

$(-1)^3$

$\boxed{-1}$

12. i^{15}

$(i^2)^7 i$

$(-1)^7 i$

$(-1)i$

$\boxed{-i}$

13. $5x^2 + 45 = 0$

$-45 \quad -45$

$\frac{5x^2}{5} = \frac{-45}{5}$

$x^2 = -9$

$\sqrt{x^2} = \sqrt{-9}$

$\boxed{x = 3i}$

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

$= 3i$

1. $(2 + i)(3 - i)$

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

$2 \cdot 3 + 2 \cdot -i + i \cdot 3 + i \cdot -i$

$6 + -2i + 3i + -i^2$

$6 + i + -i^2$ $\qquad i^2 = -1$

$6 + i + -(-1)$

$\boxed{7 + i}$

15. $\dfrac{(3 + 4i)}{(4 - 5i)} \cdot \dfrac{(4 + 5i)}{(4 + 5i)} = \dfrac{3 \cdot 4 + 3 \cdot 5i + 4i \cdot 4 + 4i \cdot 5i}{4 \cdot 4 + 4 \cdot 5i + -5i \cdot 4 + -5i \cdot 5i}$

$= \dfrac{12 + 15i + 16i + 20i^2}{16 + 20i + -20i + -25i^2}$

$= \dfrac{12 + 31i + 20i^2}{16 + -25i^2}$

$= \dfrac{12 + 31i + 20(-1)}{16 + -25(-1)}$

$= \boxed{\dfrac{-8 + 31i}{41}}$

Assignment: Handout
pp290 1-29 odds
Extra Credit: pp289 1-22 all

10. $\frac{5}{3+i}$