Sect 1.4 Complex Numbers

p. 114 # 1-33 (odds), 34, 37, 39-46, 50, 53, 55, 60, 65 (32 prob.)

		Real	Imaginary
1.	$5-7i$	5	$-7i$
3.	$\frac{-2-5i}{3}$	$-\frac{2}{3}$	$-\frac{5}{3}i$
5.	3	3	$0i$
7.	$-\frac{2}{3}i$	0	$-\frac{2}{3}i$
9.	$\sqrt{3}+\sqrt{-4}=\sqrt{3}+2i$	$\sqrt{3}$	$2i$

11. $(2-5i)+(3+4i)$

$5-i$

13. $(-6+6i)+(9-i)$

$3+5i$

15. $(7-\frac{1}{2}i)-(5+\frac{3}{2}i)$

$7-\frac{1}{2}i-5-\frac{3}{2}i$

$2-2i$

17. $(-12+8i)-(7+4i)$

$-12+8i-7-4i$

$-19+4i$

19. $4(-1+2i)$

$-4+8i$

21. $(7-i)(4+2i)$

$28+14i-4i-2i^2$

$28+10i+2$

$30+10i$

23. $(3-4i)(5-12i)$

$15-36i-20i+48i^2$

$15-56i-48$

$-33-56i$

25. $(6+5i)(2-3i)$

$12-18i+10i-15i^2$

$12-8i+15$

$27-8i$

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

29. $\frac{2-3i}{1-2i}\cdot\frac{1+2i}{1+2i}=\frac{2+4i-3i-6i^2}{1-4i^2}=\frac{8+i}{5}=\frac{8}{5}+\frac{1}{5}i$

31. $\frac{26+39i}{2-3i} \cdot \frac{2+3i}{2+3i} = \frac{52+78i+78i+117i^2}{4-9i^2} = \frac{-65+156i}{13} =$

$= \frac{13(-5+12i)}{13} = -5+12i$

33. $\frac{10i}{1-2i} \cdot \frac{1+2i}{1+2i} = \frac{10i+20i^2}{1-4i^2} = \frac{-20+10i}{5} = \frac{5(-4+2i)}{5} = -4+2i$

34. $(2-3i)^{-1} = \frac{1}{2-3i} \cdot \frac{2+3i}{2+3i} = \frac{2+3i}{4-9i^2} = \frac{2+3i}{13} = \frac{2}{13} + \frac{3}{13}i$

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

39. $i^3 = i^2 \cdot i = -1 \cdot i = -i$

40. $(2i)^4 = 16i^4 = 16 \cdot 1 = 16$

41. $i^{100} = (i^4)^{25} = (1)^{25} = 1$

42 $i^{1002} = i^{1000} \cdot i^2 = 1(-1) = -1$

43 $\sqrt{-25} = 5i$

44. $\sqrt{\frac{-9}{4}} = \frac{3i}{2}$

45 $\sqrt{-3} \cdot \sqrt{-12}$

$\sqrt{-1 \cdot 3} \cdot \sqrt{-4 \cdot 3}$

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

$2i^2 \cdot 3$

-6

46. $\sqrt{\frac{1}{3}} \cdot \sqrt{-27}$

$\sqrt{\frac{1}{3}} \cdot \sqrt{-9 \cdot 3}$

$\sqrt{\frac{1}{3}} \cdot 3i\sqrt{3}$

$3i \cdot 1$

$3i$

(Sect 1.4 cont.)

50. $(\sqrt{3}-\sqrt{-4})(\sqrt{6}-\sqrt{-8})$

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

$\sqrt{18}-2i\sqrt{6}-2i\sqrt{6}+4i^2\sqrt{2}$

$3\sqrt{2}-4i\sqrt{6}-4\sqrt{2}$

$-\sqrt{2}-4i\sqrt{6}$ or $\underline{-\sqrt{2}-4\sqrt{6}\,i}$

53. $x^2+9=0$

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

$x=\pm 3i$ or

$\{0+3i,\ 0-3i\}$

55. $x^2-4x+5=0$

$\frac{4\pm\sqrt{(-4)^2-4(1)(5}}{2(1)}=$

$\frac{4\pm\sqrt{16-20}}{2}=\frac{4\pm\sqrt{-4}}{2}$

$\frac{4\pm 2i}{2}=\frac{2(2\pm i)}{2}=2\pm i$

60. $2x^2+3=2x$

$2x^2-2x+3=0$

$\frac{2\pm\sqrt{(-2)^2-4(2)(3)}}{2(2)}=\frac{2\pm\sqrt{4-24}}{4}=\frac{2\pm\sqrt{-4\cdot 5}}{4}=\frac{2\pm 2i\sqrt{5}}{4}=$

$\frac{2(1\pm i\sqrt{5})}{2(2)}=\frac{1\pm i\sqrt{5}}{2}=\left\{\frac{1}{2}+\frac{\sqrt{5}}{2}i,\ \frac{1}{2}-\frac{\sqrt{5}}{2}i\right\}$

or $\left\{\frac{1}{2}\pm\frac{\sqrt{5}}{2}i\right\}$

65 $\frac{1}{2}x^2 - x + 5 = 0$

$$\frac{1 \pm \sqrt{(-1)^2 - 4\left(\frac{1}{2}\right)(5)}}{2\left(\frac{1}{2}\right)} = \frac{1 \pm \sqrt{1 - 10}}{1} = \frac{1 \pm 3i}{1} =$$

$$= \{1 \pm 3i\}$$