49. $x = \pm 3i$

50. $x = \pm 7i$

51. $x = \pm i\sqrt{7}$

52. $x = \pm i\sqrt{6}$

53. $x = \pm 2i\sqrt{5}$

54. $x = \pm 3i\sqrt{6}$

55. $x = \pm i\sqrt{2}$

56. $x = \pm i\sqrt{3}$

57. $x = \pm 6i$

58. $x = \pm 5i$

59. $x = \pm 3i\sqrt{3}$

60. $x = \pm 7i\sqrt{2}$

61. $x = \pm 4i\sqrt{3}$

63. i^2 can be simplified; $15 - 3i + 10i - 2i^2 = 15 + 7i + 2 = 17 + 7i$

64. Squaring a complex number requires FOIL; $(4 + 6i)(4 + 6i)$
$= 16 + 24i + 24i + 36i^2 = 16 + 48i - 36 = -20 + 48i$

65. **a.** -8
  b. $12 - 10i$
  c. $21i$
  d. $41 + 3i$
  e. $-9i$
  f. $-9 + 23i$
  g. 14
  h. $14i$

Real numbers	Imaginary numbers	Pure imaginary numbers
-8	$12 - 10i$	$21i$
14	$14 + 3i$	$-9i$
	$-9 + 23i$	$14i$

67.

Powers of i	i^1	i^2	i^3	i^4	i^5	i^6	i^7	i^8	i^9	i^{10}	i^{11}	i^{12}
Simplified form	i	-1	$-i$	1	i	-1	$-i$	1	i	-1	$-i$	1

The results of i^n alternate in the pattern i, -1, $-i$, and 1.

68. functions f and g; function h; Functions f and g have real zeros because their graphs touch the x-axis. Function h has imaginary zeros because its graph does not touch the x-axis.

71. $-15 - 25i$

72. $-24 - 10i$

73. $9 + 5i$

74. $-2 - i$