46) $f(x) = x^3 - 4x^2 - 10x + 8$ $\qquad K = -2$

$f(-2) = (-2)^3 - 4(-2)^2 - 10(-2) + 8$

$f(-2) = 4$

$(x+2)(x^2 - 6x + 2) + \frac{4}{x+2}$

$$\begin{array}{r|rrrr} -2 & 1 & -4 & -10 & 8 \\ & \downarrow & -2 & 12 & -4 \\ \hline & 1 & -6 & 2 & \vdots\ 4 \end{array}$$

$x^2 - 6x + 2$

71) $f(x) = x^3 - 2x^2 - 5x + 10$

$x = 2$

$x = 2, \pm\sqrt{5}$

$(x-2)(x+\sqrt{5})(x-\sqrt{5})$

$$\begin{array}{r|rrrr} 2 & 1 & -2 & -5 & 10 \\ & \downarrow & 2 & 0 & -10 \\ \hline & 1 & 0 & -5 & 0 \end{array}$$

$x^2 - 5 = 0$

$x^2 = 5$

$x = \pm\sqrt{5}$

63) $f(x) = 2x^3 + x^2 - 5x + 2$ $\qquad (x+2)(x-1)(2x-1)$

$$\begin{array}{r|rrrr} 1 & 2 & 1 & -5 & 2 \\ & \downarrow & 2 & 3 & -2 \\ \hline -2 & 2 & 3 & -2 & \boxed{0} \\ & \downarrow & -4 & 2 & \\ \hline & 2 & -1 & 0 & \\ & 2x & -1 & & \end{array}$$

Section 2.4 Complex Numbers

Solve: $x^2 + 1 = 0$ $\quad (x+i)(x-i)=0$

$-1 \quad -1$ $\qquad x = \pm i$

$\sqrt{x^2} = \sqrt{-1}$

$x = \pm\sqrt{-1}$

$x = \pm i$

$i = \sqrt{-1} \qquad i^2 = -1$

Simplify:

$\sqrt{20}$

$i\sqrt{20}$

$\times 5$

$2i\sqrt{5}$

$i\sqrt{5}\cdot\sqrt{10}$

$\cancel{\sqrt{50}}$

$\cancel{25\cdot 2}$

$\cancel{5\sqrt{2}}$

$i\sqrt{5}\cdot i\sqrt{10}$

$i^2\sqrt{50}$

$-5\sqrt{2}$

$(\sqrt{-75})^2$

$(i\sqrt{75})^2$

$i^2 75$

-75

$(\sqrt{-45} - \sqrt{-5})^2$

$(i\sqrt{45} - i\sqrt{5})^2$

$9\cdot 5$

$(3i\sqrt{5} - i\sqrt{5})^2$

$(2i\sqrt{5})^2$

$4i^2(5)$

-20

Complex number in standard form:

$$a + bi \qquad 3+5i$$

real imaginary

Conjugate of a complex number

$$a + bi \Rightarrow a - bi$$

opposite of the imaginary part

State the complex conjugate:

	conjugate
$3 + 2i$	$3-2i$
7	7
$-4i$	$4i$
$-5 - 3i$	$-5+3i$

Multiply each complex number by its complex conjugate.

a) $1 + i$

$(1+i)(1-i)$

$1-i+i-i^2$

$1-i^2$

$1+(+1)$

2

b) $4 - 3i$

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

$16+\cancel{12i}-\cancel{12i}-9i^2$ (-1)

$16+9$

25

c) $\sqrt{-7}$

$(i\sqrt{7})(-i\sqrt{7})$

$-i^2(7)=7$

Simplify:

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

$2i - 3 - 4i + 3 + 3i$

i

$(5 - 3i) + (3 + 5i) - (8 + 2i)$

0

$-5(3 - 2i)$

$-15 + 10i$

$3(4 + 2i)^2$

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

$3(16 + 8i + 8i + 4i^2)$

$3(16 + 16i - 4)$

$3(12 + 16i)$

$36 + 48i$

$(4 + 5i)(4 - 5i)$

$16 - \cancel{20i} + \cancel{20i} - 25i^2$

$16 + 25 = 41$

Divide. Write in standard form.

$8 + 4i + 12i + 6i^2$ $\quad 6(-1)$

$\frac{(2 + 3i)}{(4 - 2i)}\frac{(4+2i)}{(4+2i)} = \frac{2+16i}{20}$

$16 + 8i - 8i - 4i^2$

$\frac{2+16i}{20}$

$\frac{2}{20} + \frac{16}{20}i$

$\boxed{\frac{1}{10} + \frac{4}{5}i}$

$4 + 2i + 2i + i^2$

$\frac{(2 + i)}{(2 - i)}\frac{(2+i)}{(2+i)} = \frac{3+4i}{5}$

$4 + \cancel{2i} - \cancel{2i} - i^2$

$\boxed{\frac{3}{5} + \frac{4}{5}i}$

$-9i + 4i^2$

$\frac{9 - 4i}{i}\frac{(-i)}{(-i)} =$

$(-i^2)$

$\boxed{-4 - 9i}$

Solve:

$3x^2 - 2x + 5 = 0$

$$x = \frac{2 \pm \sqrt{4 - 4(3)(5)}}{2(3)}$$

$$x = \frac{2 \pm \sqrt{-56}}{6} \quad 4 \cdot 14$$

$$x = \frac{2 \pm 2i\sqrt{14}}{6}$$

$$x = \frac{1 \pm i\sqrt{14}}{3}$$

$$\frac{1}{3} \pm \frac{\sqrt{14}}{3} i$$

$8x^2 + 14x + 9 = 0$

$$\frac{-7 \pm i\sqrt{23}}{8}$$

Chapter 2.4

Pg. 150-151: #8, 9, 11-37 odd, 40, 48, 52, 59, 63, 69-72, 77, 85 86, 94