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§7.6 (continued)

(Lect. Notes p. 118)

7.6.17 Solve.

$$\underbrace{x}_{\text{term 1}} \underbrace{- \sqrt{6-5x}}_{\text{term 2}} = \underbrace{-12}_{\text{term 3}}$$

Challenge! : Complete Step 1 (isolate the radical) in the fewest number of steps possible.

$$x + 12 = \sqrt{6-5x}$$

$$(x+12)^2 = \left(\sqrt{6-5x}\right)^2$$

$$x^2 + 24x + 144 = 6 - 5x$$

$$+5x \quad -6 \qquad -6 \quad +5x$$

Sidework

$$(x+12)^2 \neq x^2 + 12^2$$

$$(x+12)(x+12)$$

$$x^2 + 12x + 12x + 144$$

$$x^2 + 24x + 144$$

No radical, so solve. (put in standard form)

$$\ldots\ldots = 0$$

factor

$$x^2 + 29x + 138 = 0$$

$$(x+6)(x+23) = 0$$

$$x + 6 \overset{\text{set}}{=} 0 \qquad x + 23 \overset{\text{set}}{=} 0$$

$$-6 \quad -6 \qquad -23 \quad -23$$

$$x = -6 \qquad x = -23$$

Must Check!

Check

$$x - \sqrt{6-5x} = -12$$

If $x = -6$

$$-6 - \sqrt{6-5(-6)} = -12$$

$$-6 - \sqrt{6+30} = -12$$

$$-6 - \sqrt{36} = -12$$

$$-6 - 6 = -12$$

$$-12 = -12 \checkmark$$

$$x = -6$$

If $x = -23$

$$-23 - \sqrt{6-5(-23)} = -12$$

$$-23 - \sqrt{6+115} = -12$$

$$-23 - \sqrt{121} = -12$$

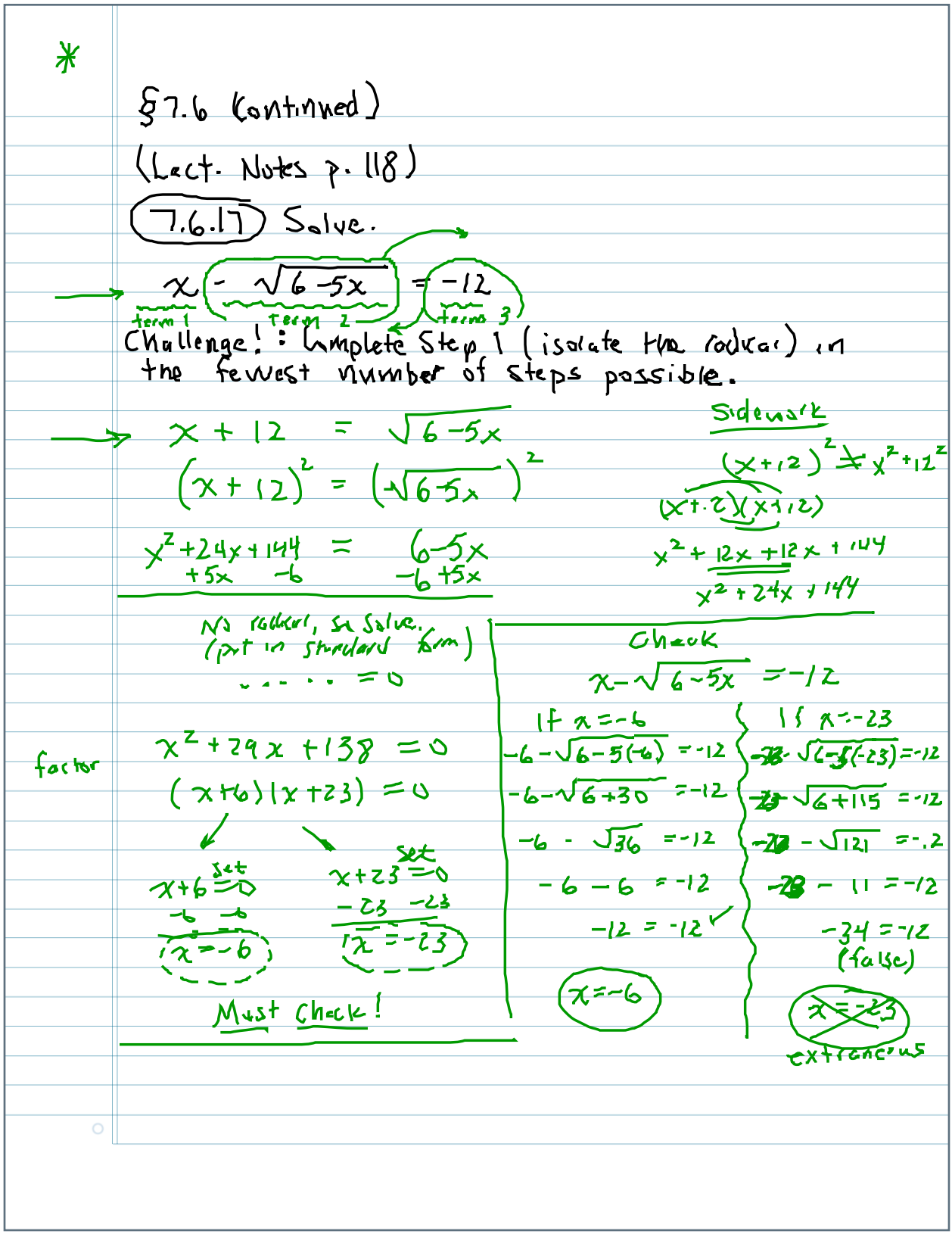
$$-23 - 11 = -12$$

$$-34 = -12$$

(false)

$$\cancel{x = -23}$$

extraneous



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§7.6 (continued)

(Lect. Notes p. 118)

7.6.17 Solve.

$$\underbrace{x}_{\text{term 1}} \underbrace{- \sqrt{6-5x}}_{\text{term 2}} = \underbrace{-12}_{\text{term 3}}$$

Challenge!: Complete Step 1 (isolate the radical) in the fewest number of steps possible.

$$x + 12 = \sqrt{6-5x}$$

$$(x+12)^2 = \left(\sqrt{6-5x}\right)^2$$

$$x^2+24x+144 = 6-5x$$

$$+5x \quad -6 \qquad -6+5x$$

Sidework

$(x+12)^2 \neq x^2+12^2$

$(x+2)(x+12)$

$x^2+12x+12x+144$

$x^2+24x+144$

No radical, so solve. (put in standard form)

$\ldots = 0$

$x^2+29x+138=0$

factor

$(x+6)(x+23)=0$

$x+6=0$ (set) $\quad x+23=0$ (set)

$-6 \quad -6 \qquad -23 \quad -23$

$x=-6 \qquad x=-23$

Must Check!

Check

$x-\sqrt{6-5x} = -12$

If $x=-6$:

$-6-\sqrt{6-5(-6)} = -12$

$-6-\sqrt{6+30} = -12$

$-6-\sqrt{36} = -12$

$-6-6 = -12$

$-12 = -12$ ✓

$x=-6$

If $x=-23$:

$-23-\sqrt{6-5(-23)} = -12$

$-23-\sqrt{6+115} = -12$

$-23-\sqrt{121} = -.2$

$-23-11 = -12$

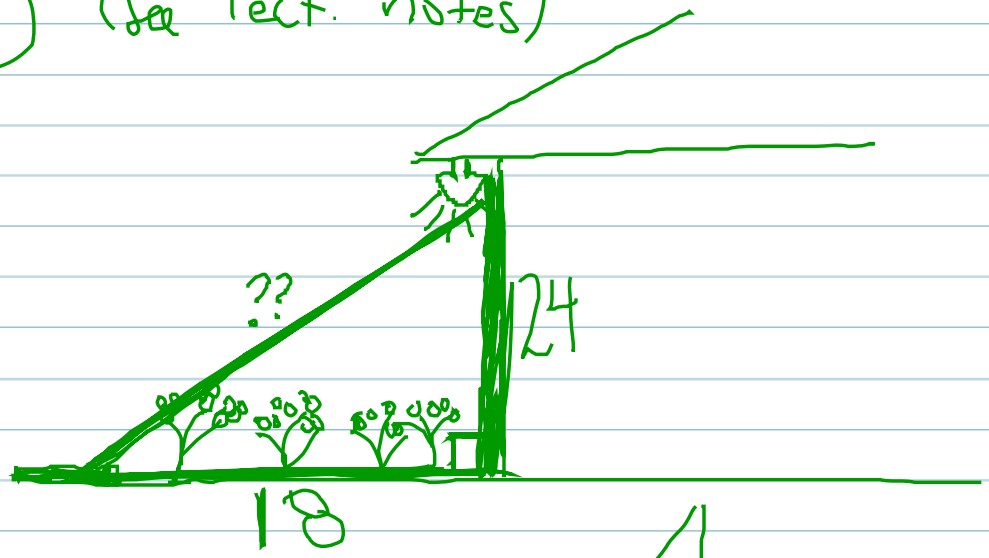
$-34 = -12$

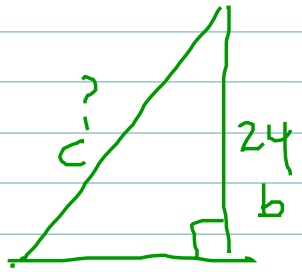
(false)

$x=-23$

extraneous

7.6 6.1 (See lect. notes)





$a^2 + b^2 = c^2$

$18^2 + 24^2 = c^2$

$324 + 576 = c^2$

$900 = c^2$

polynomial = polynomial

$\therefore \quad = 0$

$0 = c^2 - 900$

$c^2 - 900 = 0$

$(c+30)(c-30) = 0$

$c + 30 = 0$ $\quad$ $c - 30 = 0$

$-30 \quad -30$ $\quad$ $+30 \quad +30$

$c = -30$ $\quad$ $c = 30$

extraneous

$900 = c^2$

$\sqrt{900} = \sqrt{c^2}$

$30 = |c|$

$c = \pm 30$

$c = -30$ or 30

extraneous

§7.7 Complex Numbers

(Lect Notes p. 119)

The imaginary unit, written i, is the number whose square is -1

$$i^2 = -1$$

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

$$\sqrt{-a} = i\sqrt{a} \quad (a > 0)$$

(7.7.19) Multiply.

$\underbrace{\sqrt{-3}}_{\text{NOT REAL}} \cdot \underbrace{\sqrt{-6}}_{\text{NOT REAL}}$ cannot use product rule!

$i\sqrt{3} \cdot i\sqrt{6}$

$i \cdot i \cdot \sqrt{3} \cdot \sqrt{6}$ can use product rule

(REAL, REAL)

$i^2 \cdot \sqrt{3 \cdot 6}$

$-1 \cdot \sqrt{3 \cdot 3 \cdot 2}$

$-1 \cdot 3 \cdot \sqrt{2}$

$-3\sqrt{2}$

$i^2 = -1 \quad i = \sqrt{-1} \quad \sqrt{-a} = i\sqrt{a}$

7.7.65 Divide,

$\frac{\sqrt{-90}}{\sqrt{-5}}$ } NOT REAL } CANNOT USE QUOTIENT RULE

$= \frac{i\sqrt{90}}{i\sqrt{5}}$ } REAL } CAN USE QUOTIENT

$= \sqrt{\frac{90}{5}}$

$= \sqrt{18}$

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

$= 3\sqrt{2}$

$24 = 20 + 4$

7.7.1 Perform the indicated operations.

$(3+7i) - (9-7i) + (2+6i) - (3-6i)^2$

$(3+7i) - (9-7i) + (2+6i) - (-27-36i)$

$3 + 7i - 9 + 7i + 2 + 6i + 27 + 36i$

$23 + 56i$

real part — $a + bi$ — imaginary part

$\square \pm \square i$

$(3-6i)^2$

$(3-6i)(3-6i)$

$9 - 18i - 18i + 36i^2$

$9 - 36i + 36(-1)$

$9 - 36i - 36$

$-27 - 36i$

$a \pm bi$

7.7.47 Divide write the quotient in $a+bi$ form

$$\frac{8-i}{5-2i} = \frac{(8-i)(5+2i)}{(5-2i)(5+2i)} = \frac{40 + 16i - 5i - 2i^2}{25 + 10i - 10i - 4i^2}$$

"conjugate"

$$= \frac{40 + 11i - 2(-1)}{25 - 4(-1)} = \frac{40 + 11i + 2}{25 + 4}$$

$$= \frac{42 + 11i}{29} = \frac{42}{29} + \frac{11}{29}i$$

$a + bi$

"The conjugate of i is $-i$."

7.7.41 Divide. Write the quotient in $a+bi$ form.

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

i in denom. → "conjugate"

if $a=0$, don't write it

Sidework

$-(-1)$

1

p. 122

7.7.83 Find the power of i

$i^{33} = i$

$$4\overline{)33} \quad 8 \text{ R } 1$$

Remainder

① $i^1 = i$

② $i^2 = -1$

③ $i^3 = -i$

$i^4 = 1$

$$i^{33} = i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^4 \cdot i^1$$

$$= 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot i$$

$$= i$$