§7.6 #17, 53,

§7.6, 7.7 solutions are posted.

(17)

$x - \sqrt{4-3x} = -8$

$-x \qquad = -x$

$-\sqrt{4-3x} = -8 - x$

$\sqrt{4-3x} = x + 8$

$\left(\sqrt{4-3x}\right)^2 = (x+8)^2$

$4-3x = x^2 + 2(x)(8) + 8^2$

$4-3x = x^2 + 16x + 64$

$-4 + 3x = \quad + 3x - 4$

$0 = x^2 + 19x + 60$

$-\sqrt{4-3x}$

$= -(4-3x)^{\frac{1}{2}}$

can't distribute the "−" unless the power is 1.

$(a+b)^2 = a^2 + 2ab + b^2$

$(a+b)(a+b) = a^2 + ab + ba + b^2$

$= a^2 + 2ab + b^2$

one way

Magic is 60

$19 = 18+1 \quad (18)(1) = 18$

$= 17+2 \quad (17)(2) = 34$

$= 16+3 \quad (16)(3) = 48$

$= 15+4 \quad (15)(4) = 60$ ✓

$1x^2 + 19x + 60 = 0$

$(1)(60) = 60$ Factors of 60 that add to 19.

$x^2 + 19x + 60 = 0$

$x^2 + 15x + 4x + 60 = 0$

$x(x+15) + 4(x+15) = 0$

$(x+15)(x+4) = 0$

Another way

$2 \,|\, 60$

$2 \,|\, 30$

$3 \,|\, 15$

$\quad 5$

$4 + 15 = 19$

$4 \cdot 15 = 60$

$x = -15$ OR $\boxed{x = -4}$

Doesn't check

FINAL SOLUTION

See online for the check.

§7.6 Conclusion:

2 radicals in same equation.
Involves squaring twice, typically.

Isolate the ugly radical.

$$\sqrt{3x+1} + \sqrt{3x} = 2$$
$$- \sqrt{3x} = -\sqrt{3x}$$

$\sqrt{3}\,x \neq \sqrt{3x}$

$$\sqrt{3x+1} = 2 - \sqrt{3x}$$

$(a-b)^2 = a^2 - 2ab + b^2$

$$\left(\sqrt{3x+1}\right)^2 = \left(2-\sqrt{3x}\right)^2$$

$$3x+1 = \underbrace{2^2}_{a^2} - 2(\underbrace{2}_{a})(\underbrace{\sqrt{3x}}_{b}) + \underbrace{\left(\sqrt{3x}\right)^2}_{b^2}$$

$$3x+1 = 4 - 4\sqrt{3x} + 3x$$
$$+4\sqrt{3x} - 3x - 1 = -1 + 4\sqrt{3x} - 3x$$
$$4\sqrt{3x} + 0 + 0 = 3 + 0 + 0$$

$$4\sqrt{3x} = 3$$

$$\sqrt{3x} = \frac{3}{4}$$

$$\left(\sqrt{3x}\right)^2 = \left(\frac{3}{4}\right)^2$$

$$3x = \frac{3^2}{4^2} = \frac{9}{16}$$

$$\left(\frac{1}{3}\right)(3x) = \left(\frac{9}{16}\right)\left(\frac{1}{3}\right) = \left(\frac{\cancel{9}^{\,3}}{16}\right)\left(\frac{1}{\cancel{3}_{\,1}}\right) = \frac{3 \cdot 1}{16 \cdot 1} = \frac{3}{16}$$

$$\boxed{x = \frac{3}{16}}$$

§7.6 #s 1-65, every 4th plus #19

§7.7 Complex Numbers

Before today, we stopped @ $\sqrt{-4}$ & said Not Real.

Today, we deal with imaginary numbers & real & imaginary numbers mixed

↳ complex numbers.

$\sqrt{-1} = i$, $i^2 = -1$ i is the imaginary unit.

$\sqrt{-4} = \sqrt{(-1)(4)} = \sqrt{-1}\sqrt{4} = i \cdot 2 = 2i$

Complex numbers : $a + bi$, where a, b are real.

$3+2i$, $5-7i$, $\frac{13}{37} - \frac{5}{4}i$

Real numbers are complex numbers, with

0 = imaginary part Graphic, pg 462

$3 = 3 + 0i$

Complex #s

- Real
  - Rational: $\frac{2}{3}$
  - Irrational: $\sqrt{7}$, π
- Nonreal
  - Mixed: $a+bi$
  - Imaginary: bi

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

$5+2x-3+2x$

$=2+4x$ or $4x+2$

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

$=5+2i-3+2i$

$=2+4i$

collect like terms, basically. But $i^2=-1$

multiplication:

$3\cdot 2i$
yuck

$(3)(2i)=6i$

$(3i)(2i)=6i^2=-6$

Foil!

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

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

$=15-8i+12$

$=\boxed{27-8i}$

$(a+b)(a-b)=a^2-b^2$

$(a+bi)(a-bi)^2=a^2-(bi)^2=a^2-b^2i^2=\boxed{a^2+b^2}$

It's Real

The complex conjugate of $a+bi$ is $a-bi$

$(3+2i)(3-2i)=3^2+2^2=9+4=13$

$(7-3i)(7+3i)=7^2+3^2=58$

$(5+2i)(5-3i)=5^2+3^2=34$

$(3+9i)(3-9i)=3^2+9^2=36$

$(5+2x)(5-2x)=5^2-(2x)^2=25-4x^2$

$$\frac{3+2i}{5-7i} = \left(\frac{3+2i}{5-7i}\right)\left(\frac{5+7i}{5+7i}\right) = \frac{15+21i+10i+14i^2}{5^2+7^2}$$

$$= \frac{15+31i-14}{25+49} = \frac{1+31i}{74} = \frac{1}{74} + \frac{31}{74}i$$

$$a + bi$$

$$\frac{2}{3i} = \left(\frac{2}{3i}\right)\left(\frac{-3i}{-3i}\right) = \frac{-6i}{-9i^2} = \frac{-6i}{9} =$$

$$= -\frac{2}{3}i$$

$$= 0 - \frac{2}{3}i$$

Powers of i: 7.7 #s 1-84 every 4th
Due Friday.
7.6 Due Friday.

$(-1)^2 = 1$ $(-1)^4 = +1$

$(-1)^3 = -1$ $(-1)^{2732} = 1$

$i^3 = i^{2+1} = i^2 i^1 = -1 i = -i$

$i^{57} = i^{56} i^1 = i^{(2)(28)} i = (i^2)^{28} i = (-1)^{28} i$

$= 1 i$

$i^{59} = i^{58} i^1 = (i^2)^{29} i = (-1)^{29} i = -i$