

009 § 2.1 # 1-53 odds

# 1-18 solve the following equations

①  $7y - 4 = 2y + 11$

$-2y + 4 \quad -2y + 4$

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$5y = 15$

$y = \frac{15}{5} = \boxed{3 = y}$

③  $-\frac{2}{5}x + \frac{2}{15} = \frac{2}{3}$

LCD = 3 · 5

$-\frac{2x}{5} \cdot \frac{3}{3} + \frac{2}{3 \cdot 5} = \frac{2}{3} \cdot \frac{5}{5}$

$-\frac{6x + 2}{LCD} = \frac{10}{LCD}$

$-6x + 2 = 10$

$-6x = 8$

$x = -\frac{8}{6} = \boxed{-\frac{4}{3} = x}$

⑤  $.14x + .08(10,000 - x) = 1220$

$100(.14x) + 100(.08)(10,000 - x) = 100(1220)$

$14x + 8(10,000 - x) = 122,000$

$14x + 80,000 - 8x = 122,000$

$6x = 42,000$

$x = \frac{42,000}{6} = \boxed{7,000 = x}$

$$\begin{array}{r} 122,000 \\ - 80,000 \\ \hline 42,000 \end{array}$$

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$$\textcircled{7} \quad 5(y+2) - 4(y+1) = 3$$

$$5y + 10 - 4y - 4 = 3$$

$$y + 6 = 3$$

$$\boxed{y = -3} \quad y \in \{-3\}$$

$$\textcircled{9} \quad x^2 - 5x - 6 = 0$$

$$(1)(-6) = -(3)(2)$$

$$-1 + 6 = 5$$

$$1 - 6 = -5$$

$$x^2 + 1x - 6x - 6 = 0$$

$$x\left(\frac{x^2}{x} + \frac{x}{x}\right) - 6\left(\frac{-6x}{-6} + \frac{-6}{-6}\right) = 0$$

$$x(x+1) - 6(x+1) = 0$$

$$(x+1)(x-6) = 0$$

$$\boxed{x \in \{-1, 6\}}$$

$$a=1, b=-5, c=-6$$

$$b^2 - 4ac = (-5)^2 - 4(1)(-6)$$

$$= 25 + 24 = 49$$

$$\sqrt{b^2 - 4ac} = \sqrt{49} = 7$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-5) \pm 7}{2(1)} = \frac{5 \pm 7}{2}$$

$$x \in \{-1, 6\} \quad \frac{12}{2} = 6 \quad \frac{-2}{2} = -1$$

Factoring "cheat"  $\left\{ \begin{array}{l} (x-6)(x-(-1)) = 0 \\ (x-6)(x+1) = 0 \end{array} \right.$

$$\textcircled{11} \quad 9a^3 - 16a = 0$$

$$a(9a^2 - 16) = 0$$

$$a(3^2 a^2 - 4^2) = 0$$

$$a(3a^2 - 4^2) = 0$$

$$a(3a-4)(3a+4) = 0$$

$$\underline{a=0}, \quad 3a-4=0, \quad 3a+4=0$$

$$3a=4$$

$$3a=-4$$

$$\underline{a = \frac{4}{3}}$$

$$\underline{a = -\frac{4}{3}}$$

$$\boxed{a \in \left\{-\frac{4}{3}, 0, \frac{4}{3}\right\}}$$

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(13)  $(x+6)(x-2) = -7$

$$x^2 - 2x + 6x - 12 = -7$$

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

$$(x-1)(x+5) = 0$$

$$x-1=0 \text{ OR } x+5=0 \quad \sqrt{b^2-4ac} = \sqrt{36} = 6$$

$$x=1 \text{ OR } x=-5$$

$$x \in \{-5, 1\}$$

Favorite trick question!

$$a=1, b=4, c=-5$$

$$b^2-4ac = 4^2 - 4(1)(-5)$$

$$= 16 + 20 = 36$$

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-4 \pm 6}{2}$$

$$= \frac{-4+6}{2} = \frac{2}{2} = 1 = x$$

$$= \frac{-4-6}{2} = \frac{-10}{2} = -5 = x$$

(15)  $2y^3 - 9y = -3y^2$

$$2y^3 + 3y^2 - 9y = 0$$

$$y(2y^2 + 3y - 9) = 0$$

$$y=0 \text{ OR } 2y^2 + 3y - 9 = 0$$

$$(2)(-9) = -(2)(3)(3)$$

want sum of 3,

$$(6)(-3)$$

$$6-3=3$$

$$2y^2 + 6y - 3y - 9 = 0$$

$$2y(y+3) - 3(y+3) = 0$$

$$(y+3)(2y-3) = 0$$

$$y+3=0$$

$$2y-3=0$$

$$y=-3$$

$$2y=3$$

$$y = \frac{3}{2}$$

$$y \in \{-3, 0, \frac{3}{2}\}$$

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(17)  $4x^3 + 12x^2 - 9x - 27 = 0$

$$\begin{aligned} & -9x - 27 \\ & = -9\left(\frac{-9x}{-9} + \frac{-27}{-9}\right) \\ & = -9(x+3) \end{aligned}$$

$$4x^2(x+3) - 9(x+3) = 0$$

$$(x+3) \left( \frac{4x^2(x+3)}{x+3} + \frac{-9(x+3)}{x+3} \right) = 0$$

$$(x+3)(4x^2 - 9) = 0$$

$$(x+3)(2x-3)(2x+3) = 0$$

$$x+3=0 \text{ OR } 2x-3=0 \text{ OR } 2x+3=0$$

$$x=-3 \qquad 2x=3 \qquad 2x=-3$$

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

$$x \in \left\{ -3, -\frac{3}{2}, \frac{3}{2} \right\}$$

(19) work each, according to instructions

(a) solve  $8x-5=0$  (b) Add:  $(8x-5)+(2x-3)$

$$\begin{array}{r} 8x-5=0 \\ +5 = +5 \\ \hline 8x = 5 \end{array}$$

$$= \boxed{10x-8}$$

$$x = \frac{5}{8}$$

$$x \in \left\{ \frac{5}{8} \right\}$$

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(19) (c) Multiply:  $(8x-5)(2x-3)$

$$= 16x^2 - 24x - 10x + 15$$

$$= 16x^2 - 34x + 15$$

(d) Solve:  $16x^2 - 34x + 15$  They factored for us!

$$= 16x^2 - 24x - 10x + 15$$

Reverse steps  
from part (c)

$$= 8x(2x-3) - 5(2x-3)$$

$$= (2x-3)(8x-5) \stackrel{\text{SET}}{=} 0 \rightarrow$$

$$2x-3=0 \quad \text{OR} \quad 8x-5=0$$

$$2x=3 \quad \quad \quad 8x=5$$

$$x = \frac{3}{2} \quad \text{OR} \quad x = \frac{5}{8}$$

$$\Rightarrow x \in \left\{ \frac{5}{8}, \frac{3}{2} \right\}$$

(21) Solve Each Equation

(a)  $9x-25=0$       (b)  $9x^2-25=0$

$$9x=25$$

$$x = \frac{25}{9}$$

$$x \in \left\{ \frac{25}{9} \right\}$$

$$(3x-5)(3x+5)=0$$

$$3x-5=0 \quad \text{OR} \quad 3x+5=0$$

$$3x=5$$

$$x = \frac{5}{3}$$

$$3x=-5$$

$$x = -\frac{5}{3}$$

$$x \in \left\{ \pm \frac{5}{3} \right\}$$

$$099 \text{ S}'_{2,1} \#521-53$$

$$(c) \quad 9x^2 - 25 = 56$$

$$\quad \quad \quad -56 = -56$$

$$\hline 9x^2 - 81 = 0$$

$$9(x^2 - 9) = 0$$

$$9 = 0 \quad \text{OR} \quad x^2 - 9 = 0$$

$$\text{N/A} \quad (x-3)(x+3) = 0$$

$$x-3=0 \quad \text{OR} \quad x+3=0$$

$$x=3 \quad \text{OR} \quad x=-3$$

$$x \in \{ \pm 3 \}$$

$$(d) \quad 9x^2 - 25 = 30x - 50$$

$$\quad \quad \quad -30x + 50 = -30x + 50$$

$$9x^2 - 30x + 25 = 0$$

$$(3)(3)$$

$$(5)(5)$$

$$(-3)(5) \quad (-3)(5)$$

$$-15 - 15 = -30$$

$$9x^2 - 15x - 15x + 25 = 0$$

$$3x(3x-5) - 5(3x-5) = 0$$

$$(3x-5)(3x-5) = 0$$

$$3x-5=0$$

$$\boxed{\begin{array}{l} 3x=5 \\ x=\frac{5}{3} \end{array}}$$

Quadratics!

Get = 0 on the right

Special

Perfect Square Binomial

$$ax^2 + bx + c = 0$$

takes the form

$$a^2 \pm 2ab + b^2$$

$$= (a \pm b)^2$$

$$9x^2 - 30x + 25$$

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

$$a^2 - 2ab + b^2$$

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

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

IF you can recognize this, it can save time.

Still have quadratic formula back-up!

099 §2.1 #s 23-53

#23-46 Solve each eq'n

23)  $-3 - 4x = 15$

$$-4x = 18$$

$$x = \frac{18}{-4} = -\frac{9}{2} = -\frac{9}{2} = x$$

$$x \in \left\{ -\frac{9}{2} \right\}$$

25)  $x^3 - 5x^2 + 6x = 0$

$$x(x^2 - 5x + 6) = 0$$

$$x = 0 \text{ OR } x^2 - 5x + 6 = 0$$

$$(x-2)(x-3) = 0$$

$$x = 2 \text{ OR } x = 3$$

$$x \in \{2, 3\}$$

27)  $0 = 6400a + 70 = 0$

$$6400a = -70$$

$$a = -\frac{70}{6400} = -\frac{7}{640} \quad \text{is lowest terms}$$

$$a \in \left\{ -\frac{7}{640} \right\}$$

$$\begin{array}{r} 2 \overline{)640} \\ 2 \overline{)320} \\ 2 \overline{)160} \\ 2 \overline{)80} \\ 2 \overline{)40} \\ 2 \overline{)20} \\ 2 \overline{)10} \\ \underline{5} \end{array}$$

29)  $5(2x+1) = 12$

$$10x + 5 = 12$$

$$10x = 7$$

$$x = \frac{7}{10}$$

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(31)  $100P = 2400$

$$P = \frac{2400}{100} = 24$$

$$P \in \{24\}$$

(33)  $5\left(-\frac{19}{3}\right) + 5y = 9$

$$\frac{5\left(-\frac{19}{3}\right) + 5y}{3} = 9$$

$$-\frac{19}{3} + 5y = 9$$

$$-\frac{19}{3} + \frac{5y \cdot 3}{1 \cdot 3} = \frac{9 \cdot 3}{1 \cdot 3}$$

$$\frac{-19 + 15y}{LCD} = \frac{27}{LCD}$$

$$-19 + 5y = 27$$

In the sequel, throwing away LCD will not work. Keep eyes peeled for §5.5, where I'll add problems like #41,

§5.5 §

$$\frac{2}{y^2-7y+12} - \frac{1}{y^2-9} = \frac{4}{y^2-y-12}$$

NOT IN BOOK §

$$\frac{2}{y^2-7y+12} - \frac{1}{y^2-9} < \frac{4}{y^2-y-12}$$

But you'll see same in MAT 121!



099 § 2.1 #5 35-53

$$(35) 3x^2 + x = 10$$

$$3x^2 + x - 10 = 0$$

$$ac = (3)(-10) = -(3)(5)(2) = ac$$

want +1 for +x

$$+6 - 5$$

$$3x^2 + 6x - 5x - 10 = 0$$

$$3x(x+2) - 5(x+2) = 0$$

$$(x+2)(3x-5) = 0$$

$$x+2=0 \text{ OR } 3x-5=0$$

$$x = -2$$

$$3x = 5$$

$$x = \frac{5}{3}$$

$$x \in \left\{ -2, \frac{5}{3} \right\}$$

$$(37) (y+3)^2 + y^2 = 9$$

$$y^2 + 6y + 3^2 + y^2 = 9$$

$$2y^2 + 6y = 0$$

$$2y(y+3) = 0$$

$$2y = 0$$

$$y+3=0$$

$$y = \frac{0}{2} = 0$$

$$y = -3$$

$$y \in \{-3, 0\}$$

099 § 2.1 # 539-53

$$(39) 15 - 3(x-1) = x - 2$$

$$15 - 3x + 3 = x - 2$$

$$-3x + 18 = x - 2$$

$$-x - 18 = -x - 18$$

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$$-4x = -20$$

$$x = \frac{-20}{-4} = 5 = x$$

$$x \in \{5\}$$

$$(41) 2(20+x) = 3(20-x)$$

$$40 + 2x = 60 - 3x$$

$$-40 + 3x = -40 + 3x$$

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$$5x = 20$$

$$x = 4$$

$$x \in \{4\}$$

$$(43) .08x + .09(9000 - x) = 750$$

$$100(.08x) + 100(.09)(9000 - x) = 100(750)$$

$$8x + 9(9000 - x) = 75000$$

$$8x + 81000 - 9x = 75000$$

$$-x = -6000$$

$$x = 6000$$

$$x \in \{6000\}$$

M2

$$.08x + 810 - .09x = 750$$

$$-.01x = -60$$

$$x = \frac{-60}{-.01} = 6000$$

099 §2.1 #5 45-53

(45)  $(x+3)^2 + 1^2 = 2$

$x^2 + 6x + 9 + 1 = 2$

$x^2 + 6x + 8 = 0$

$(x+4)(x+2) = 0$

$x = -4$  OR  $x = -2$

$x \in \{-4, -2\}$

(47)  $3x - 6 = 3(x + 4)$

$3x - 6 = 3x + 12$

$0 = 18$  !

No way

$\emptyset$

(49)  $2(4t - 1) + 3 = 5t + 4 + 3t$

$8t - 2 + 3 = 8t + 4$

$8t + 1 = 8t + 4$

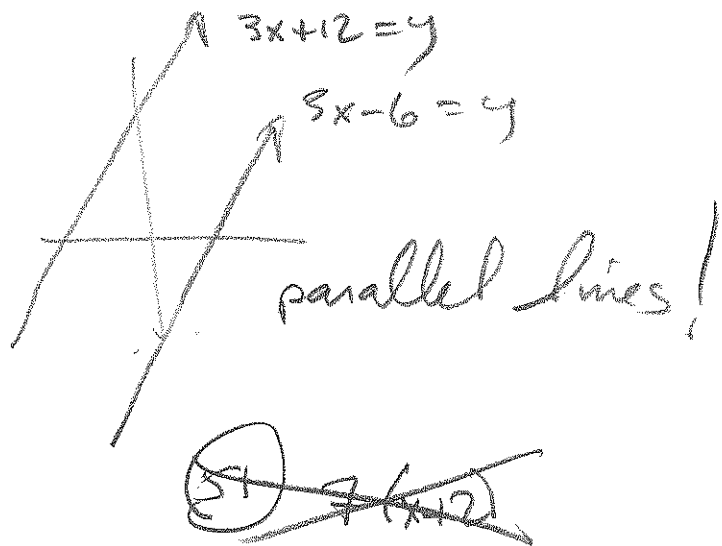
$0 = 3$  ?

$\emptyset$

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

$(x+3)^2 = x^2 + 2(x)(3) + 3^2$

#s 47-52 solve, if possible.



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(51)  $7(x+2) - 4(2x-1) = 18 - x$

$$7x + 14 - 8x + 4 = 18 - x$$

$$-x + 18 = 18 - x$$

$$0 = 0$$

ALWAYS TRUE!

$$x \in (-\infty, \infty) = \{x \mid x \text{ is real}\} = \mathbb{R}$$

(53) Adiabatic Cooling/Warming Short hand

Let  $T =$  Temperature ( $^{\circ}\text{F}$ )

$A =$  Altitude (presumably in feet)

Then air cools according to

$T = -.0035A + 70$ , when ground temp is  $70^{\circ}\text{F}$  we find when temp

is  $-35^{\circ}\text{F}$ :

$$T = -.0035A + 70 \quad \text{SET } T = -35$$

$$-.0035A = -105$$

$$A = \frac{-105}{-.0035} = \frac{30000}{.0035} = \frac{210000}{.0035} = \frac{1050000}{.0035} = \frac{35}{.0035} = 7$$

$$= \boxed{30,000 \text{ ft}}$$