(BMT-222) (september 2018)

Chapter 6 Quadratic Equations (Summary)

Exercises / Section 6.1 (page 203)

- Solve the given pure quadratic equations.

Problem # 1. $x^2-1=0$, **Problem # 5.** $x^2-9=0$, **# 9:** $2x^2-32=0$ **# 11:** $36x^2-25=0$

- Solve the given quadratic equations by the method of factoring.

Problem # 15: $x^2+2x-24=0$ **Problem # 19:** $3x^2+7x+2=0$ **Problem # 21:** $4x^2+5x-6=0$

Problem # 27: $30x^2=7x+15$ **Problem # 39:** $18x^2=93x-110$

Problem # 45. The path of an object tossed to an angle of 45^0 to the ground is $y=x-32\frac{x^2}{v_0^2}$, where v_0 is the initial velocity in feet per second and y is the distance in feet above the ground. How far from the starting point $(x=0)$ will the object land?

Problem # 47: The load on a beam of length L is such that the deflection is given by $d=3x^4-4Lx^3+L^2x^2$, where x is the distance from the one end. Determine where the deflection is zero. (Hint: factor out x^2)

(Problems solved in class # 1, 5, 15, 21, 45) HW: Problem # 9, # 11, # 19, # 27, # 39

Exercises / Section 6.2 (page 208)

- Solve each equation by completing the square.

Problem # 3: $x^2+4x-12=0$ **Problem # 13** $2x^2-6x+1=0$ **Problem # 21** $4x^2-x-3=0$

Problem # 23: $6x^2+x+2=0$ **Problem # 29** $7x^2+2x-1=0$ **Problem # 37** $x^2-bx+2=0$

Problem # 39: $ax^2+5x-1=0$

(Problems solved in class # 3, 23, 39) HW: Problem # 13, # 21, # 29, # 37

Exercises / Section 6.3 (page 213-214)

- Solve each equation by the quadratic formula.

Problem # 5 $2x^2=5x-2$ **Problem # 17** $3x^2+3x+1=0$ **Problem # 23** $5x^2+1=0$

Problem # 25 $2x^2+3x=0$ **Problem # 31** $4x^2-12x+9=0$ **Problem # 33** $4x^2-20x+25=0$

Problem # 43 Solve the given equation for x in terms of y: $x^2-4xy+4y^2-1=0$

Problem # 51 Solve the given equation for x $\frac{1}{x+2}+\frac{1}{x}=\frac{5}{12}$ **Problem # 53** $\frac{1}{x}+\frac{1}{x-4}=\frac{3}{8}$

(Problems solved in class # 5, 25, 33, 53) HW: Problem # 17, # 23, # 31, # 43, # 51

Exercises / Section 6.4 (page 217-218)

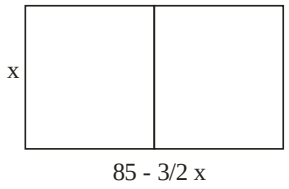
Problem # 5 Recall that the relationship of the focal length f of a lens to the object distance q and the image distance p is $\frac{1}{f}=\frac{1}{p}+\frac{1}{q}$. If $f=2.0\ cm$ and p is 3.0 cm longer than q, find p.

Problem # 7 A parallelogram has an area of 149.0 inch^2, and the base exceeds the height by 10.00 inch. Find the base and height?

Problem # 13 If both inlet of a tank are open, then the tank can be filled in 2 hours. One of the inlet alone requires $5\frac{1}{3}$ hours more than the other to fill the tank. How long does each one take?

Problem # 17 In city traffic, a car travels 15 mi/hr faster than a bicycle. The car can travel 50 mi in 3 hours less time than the bicycle. Find the rate of each.

Problem # 19 A rectangular enclosure is to be fenced along four sides and divided in to two parts by a fence parallel to one of the side (see figure). If 170 ft of fence are available and the total area is 1200 ft^2, what are the dimensions? (There are two possible solutions.)



Problem # 21 The cost of carpeting an office at 10 $\$/ft^2$ was 1500 $\$$. If the length exceeds the width by 5 ft, what are the dimensions of the office?

Problem # 23 An engineer wants to buy $\$240$ worth of stock. One stock costs $\$10$ more per share than another, if she decides to buy the cheaper stock, she can afford four more shares. How many shares of the more expensive stock can she buy?

(Problems solved in class # 5, 17, 23) HW: Problem # 7, # 13, # 19, # 21

Solved Examples

Example # 1

The area of a rectangle is $23.6\,cm^2$ and its with is $3.1\,cm$ shorter than its length. Determine the dimensions of the rectangle, correct to 3 significant figures.

Solution:

Let the length of the rectangle be $x\,cm$. Then the width be $(x-3.1)\,cm$

$Area = length \times width, \quad x(x-3.1) = 23.6 \Rightarrow x^2 - 3.1x - 23.6 = 0$

Using quadratic formula: $x = 6.65\,cm$ *or* $x = -3.55\,cm$

Negative solution neglected because length can not be negative. $\therefore x = 6.65\,cm$ and $width = x - 3.1 = 6.65 - 3.1 = 3.55\,cm$.

The dimensions of the rectangle are: $6.65\,cm$ *by* $3.55\,cm$.

Example # 2

Two resistors when connected in series have a total resistance of $40\,\Omega$. When connected in parallel their total resistance is $8.4\,\Omega$. If one of the resistors has a resistance of $R_x\,\Omega$

(a) Show that $R_x^2 - 40R_x + 336 = 0$

(b) Calculate the resistance of each ($12\,\Omega$ *and* $28\,\Omega$)

Solution:

Let resistors be R_x *and* R_y,

When in series, $R_x + R_y = 40$ (1)

and when in parallel, $\frac{1}{R_x} + \frac{1}{R_y} = \frac{1}{8.4} \Rightarrow \frac{R_x + R_y}{R_x R_y} = \frac{1}{8.4}$, using equation (1), $\Rightarrow \frac{40}{R_x R_y} = \frac{1}{8.4} \Rightarrow \frac{336}{R_x} = R_y$

Substituting R_y in equation (1), $R_x + \frac{336}{R_x} = 40 \Rightarrow \frac{R_x^2 + 336}{R_x} = 40 \Rightarrow R_x^2 - 40R_x + 336 = 0$

(b) Using quadratic formula