Name: Date:
Algebra 2

Cumulative Review—Worksheet # 3

Carefully solve the following word problems. You should **not** use a calculator on problems 1-3.

1. The length of a rectangle is $x+5$ and its height is $x-3$. The area of the rectangle is $48\ \text{in}^2$. Find x. Then find the perimeter of the rectangle. (Solve this problem by setting up and solving an equation. Do not use guess and check.)

2. The base of a triangle is $x+3$ and its height is $x-2$. The area of the triangle is $12\ \text{cm}^2$. Find x. Then find the base and the height of the triangle. (Solve this problem by setting up and solving an equation. Do not use guess and check.) Note: The area of a triangle is given by the formula $A=\frac{1}{2}bh$.

3. The sides of a right triangle are $x-5$, $x+2$, and $x+3$. Sketch this triangle. (Hint: You know which side is longest). Then find the value of x, the perimeter of the triangle, and the area of the triangle. Note: You will have to use the Pythagorean formula, $a^2+b^2=c^2$.

You may use the calculator to solve problems 4-8. Give answers rounded to two decimal places. Note: On the midterm, you will be provided with any necessary graphs.

4. A penny is tossed off a tower 500 feet high. Its height (in feet) t seconds after it is dropped is given by the equation $h(t)=-16t^2+11t+500$
   a. When does it land?
   b. How high is it 2 seconds after it is dropped?
   c. When is it exactly 150 feet high?
   d. What is the penny's maximum height?

5. The function $p(x)=-2x^2+11x+24$ describes the profits a company earns if it charges x dollars for its product. What are its highest possible profits, and what price should it charge to earn them?

6. A box's length exceeds its width by 2 cms. Its height is 3 cms less than its width. Its volume is 430 cubic cm. Find the dimensions of the box.

7. A company manufactures cardboard boxes in the following way: they begin with 10"-by-20" pieces of cardboard, cut an x"-by-x" square from each of the four corners, then fold up the four flaps to make an open-top box.

   a. Sketch a picture or pictures of the manufacturing process described above. Label all segments in your diagram with their lengths (these will be formulas in terms of x).

   b. What are the length, width, and height of the box, in terms of x?

   c. Write a function $V(x)$ expressing the volume of the box.

   d. What values of x make sense in the context of this problem? (Your answer should be an inequality).

   e. Make the graph $V(x)$ on your calculator, then sketch it on paper.

   f. Find the value (or values) of x that would result in a volume of 100 cubic inches.

   g. What value of x would produce a box with maximum volume?

   h. What are the dimensions and the volume for the box of maximum volume?

   i. Suppose that the box was made by cutting $2x$"-by-$2x$" squares at the corners (rather than x-by-x squares). Write a function for the new volume. Then find the maximum possible volume for the box.

8. A box has an x by x square base and a height of $8 - x$. The volume of the box is given by the function $V(x) = (8 - x)x^2$.

   a. Sketch a picture of the box.

   b. What values of x make sense in the context of this problem? (Your answer should be an inequality).

   c. Make the graph $V(x)$ on your calculator, then sketch it on paper.

   d. Find the value (or values) of x that would result in a volume of 60 cubic inches.

   e. What value of x would produce a box with maximum volume? What is the maximum volume?

Answers:

1. $x = 7$, perimeter is 32 in. 2. $x = 5$, base is 8 cm, height is 3 cm.

3. $x = 10$ (not 2), perimeter is 30 units, area is 30 square units.

4a. 5.94 seconds b. 458 ft c. 5.03 second d. 501.89 feet

5. price = $2.75; profit = $39.13

6. width = 8.17 cm; length = 10.17 cm; height = 5.17 cm

7. b. length = 20 – 2x; width = 10 – 2x; height = x

c. v(x) = x(10 – 2x)(20 – 2x)

d. 0 < x < 5

f. x = .61, x = 3.95

g. 2.11

h. height = 2.11; length = 15.78; width = 5.78; volume = 192.45

i. v(x) = 2x(20 – 4x)(10 – 4x); volume = 192.45

8. b. 0 < x < 8

d. 3.76

e. x = 5.33; volume = 75.85