Week 9 Algebra 2 Assignment:

Day 1: pp. 176-177 #1-10, 12-22 even, 25-29
Day 2: pp. 182-183 #1-23 odd, 27-32
Day 3: pp. 185-186 #1-23 odd, 28-32
Day 4: pp. 189-191 #1-15 odd

Notes on Assignment:

Pages 176-177

Work to show:

#1-10: Answers only
#12-16: Graphs and additional answers.
#18-22: Answers only
#25-29: Show the combination or composition and then simplify.

#1-6: Start by giving the ordered pair of the vertex. The line of symmetry will go through the x-coordinate of your vertex and be of the form x = # (since it is a vertical line). by looking at the sign on the coefficient of x^2, determine whether it opens upward or downward. (A negative coefficient will make it open downward.) If the parabola opens upward, then your vertex is a minimum point. If it opens downward, then the vertex is a maximum point.

#7-10: The zeros are the values of x for which the function equals zero. (i.e. They are the values of x where the function crosses the x-axis.)

#12-14: You know that these have their vertex at the origin. Draw your line of symmetry. Graph a couple of other points and reflect them across the line to get a good idea of what the graph looks like. After you graph it, take a look at the x-values that you are allowed to use. (Are there any that you would not be allowed to put in for x? If not, then the domain is the set of all real numbers.) For the range, look at your parabola and see which values along the y-axis have points to the left or right of them. (i.e. Which values of y are used to graph the function?)

#16: What kind of numbers are 3 and -3? This is the description they are looking for to describe the 2 graphs.

Pages 182-183:

Work to show:

#1-9: Four answers for each problem
#11-17: Graphs (tables optional)
#19-21: Show the function in the form $f(x) = ax^2 + bx + c$, then show it factored or solved by quadratic formula.
#23: Graph
#27-32: Show work for solving each equation.

Notes for this section: Remember that the standard form for a parabola is

$$y = a(x-h)^2 + k$$

From $y = a(x-h)^2 + k$ we get the following information:

- The vertex is (h, k).
- If a is positive the parabola opens up and the vertex is the minimum point.
- If a is negative the parabola opens down and the vertex is the maximum point.
- The larger $|a|$ is, the steeper (narrower) the parabola is.
- The line of symmetry is. $x = h$.

Considering the graph of $y = x^2$, the following equations have the same shape, but would be shifted as follows:

- $y = x^2 + 3$ is the graph of $y = x^2$ shifted 3 units up.
- $y = (x-6)^2$ is the graph of $y = x^2$ shifted 6 units right.*
- $y = (x+7)^2 - 5$ is the graph of $y = x^2$ shifted 7 units left and 5 units down.

*The left and right shift is in the opposite direction of what the sign would indicate.

#1-9: Use the information above to find all of the asked for information.

#11-17: Use the kind of information asked for in problems #1-9, but actually graph these. If it is not a standard-shaped parabola (i.e. if a is something other than 1), then put in a value just to the left or right of the x-value of the vertex to find another point. Reflect that point through the line of symmetry for another point. Sketch the graph.

#19: To find the zeros, we let f(x) = 0 and solve the resulting quadratic. The quadratic needs to be of the form $f(x) = ax^2 + bx + c$. For this problem you will have to multiply out the squared binomial using FOIL, and then try to solve the quadratic by factoring. If it won't factor you can always use the quadratic formula.

#21: Refer to the original equation for the vertex. Then graph your zeros (which are your x-intercepts). Sketch the graph.

Pages 185-186:

Work to show:

#1-15: Show the completing the square process.
#17-23: Show the completing the square process, then graph (tables optional).
#28-32: Show work.

Notes for this section: To write a quadratic in the form $y = a(x-h)^2 + k$ you must do so by completing the square. Here is an example:

$$f(x) = 2x^2 - 12x + 26$$

Factor out the 2. Put in your blanks.

$$f(x) = 2(x^2 - 6x + \_\_\_) + 26 - \_\_\_$$

Note that since we are staying on the same side of the = we must add and subtract the same number.

$$f(x) = 2(x^2 - 6x + \_\_\_) + 26 - \_\_\_$$

Fill in the blank. (Take ½ of -6 and square it.)

$$f(x) = 2(x^2 - 6x + \underline{9}) + 26 - \_\_\_$$

We did not add 9, we really added 2·9 = 18. Put 18 in the other blank.

$$f(x) = 2(x^2 - 6x + \underline{9}) + 26 - \underline{18}$$

Factor the trinomial.

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

#3: Be careful pulling out the -1. Watch your signs carefully.

#5: When you pull out the ½ your $8x$ turns into a $16x$ since 8 divided by ½ is 16. Always multiply back mentally to be sure you have the correct numbers.

#17-23: Do these the same as the previous problems, only sketch the graphs after you get it into standard form.

#28: Use the midpoint formula in section 3.9.

#30: If it has one rational root, then that means the radical drops out in the quadratic formula. This means that the discriminant must equal zero. Set $b^2 - 4ac = 0$ using the values in your given equation and solve for b.

#31: If your quadratic has complex roots, then the discriminant must have been negative. Set $b^2 - 4ac < 0$ using the values in your given equation and solve for c.

#32: The distance between any 2 numbers is the absolute value of their difference. You are looking for the distance between x and k to be less than 4 units.

Pages 189-190:

Work to show:

#1: Answer as directed.
#3-15: These are 5-step word problems.

#1: Let x = one number and 120/x be the other number (since their product is 120). Now you have Sum = x + 120/x. Choose whatever variable that you want for your equation S(x) is a good one. Write S(x) = x + x/120. That's all you have to do for this problem.

#3: Use the hint given, and use P(x) to stand for "product." You need to write the function in standard form so that you can see what the vertex is, since the vertex always gives you your maximum or minimum point. The x-coordinate of your vertex for this problem is your x, and you can use that to find your other number, which is x+8. The y-coordinate is your product.

#5: Remember that when we know what 2 numbers add to, we always so the same thing for the let statements. If the sum is 42, we have x and 42-x for our numbers. Write the function P(x) for the product and find the vertex.

#7: Your area function can be called A(x) = length · width. Write your let statements and fill in for the length and width.

#9: This is similar to one that we did in class. Use the given function and put it in standard form to find the vertex. The parabola will open down, which means the vertex is your maximum point. The x-coordinate is the # of hundreds of items that give you a maximum profit. The y-coordinate is your maximum profit, because it stands for P(x).

#11: Use the function given and find the vertex. This will be your maximum point. The x-coordinate is the time in seconds to reach the height h(t) (which is our y-coordinate).

#13: This is just like #11.

#15: Let x = the number of $4 increases. To maximize the income, we need to write a function for finding the income. To find the income, we multiply the number of items sold time the price for each. The price of each is $80 + $4 for every increase in price we add, so we write $80 + 4x since each increase is $4. The number of items sold is 60 – 2 for every increase in price, so we write 60 – 2x. Your income then, would be $I(x) = (80+4x)(60-2x)$. Use that for your function and maximize it (find the vertex).

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