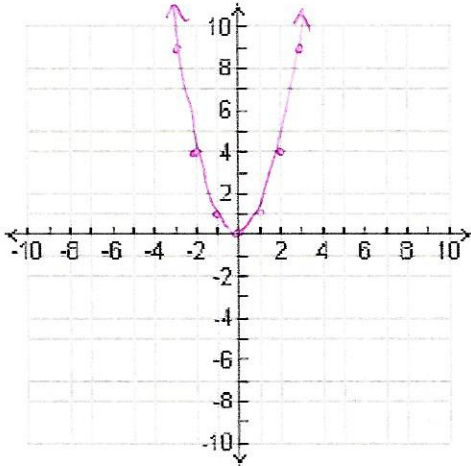


Name: Chansen  
 Date: \_\_\_\_\_ Period: \_\_\_\_\_

**SECONDARY MATH II**  
**Module 2 Study Guide: Structure of Expressions**

**Directions:** Show ALL work and make sure to write clearly, graph your functions neatly, and label appropriately.

1. Graph  $f(x) = x^2$ .



Describe how the following functions have been transformed (translated, reflected, rotated, dilated) from  $f(x) = x^2$ .

2.  $f(x) = -x^2$   
 reflected across x-axis

3.  $f(x) = x^2 + 3$   
 ↑ 3

4.  $f(x) = 3x^2$   
 dilated 3

5.  $f(x) = (x - 3)^2$   
 → 3

Identify a, b, and c using  $f(x) = ax^2 + bx + c$ .

6.  $f(x) = -2x^2 + 3x + 2$

a = -2  
 b = 3  
 c = 2

7.  $f(x) = x^2 - 5x + 4$

a = 1  
 b = -5  
 c = 4

8.  $f(x) = -x^2 + 8x - 9$

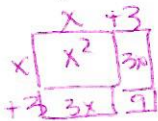
a = -1  
 b = 8  
 c = -9

Are the following perfect squares? If so, draw the diagram for the expression and write the trinomial as a product of two binomials. If not, write what you would need to add or subtract to complete the square.

9.  $f(x) = x^2 + 6x + 9$

Perfect square? yes

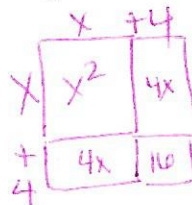
Diagram:



10.  $f(x) = x^2 + 8x + 16$

Perfect square? yes

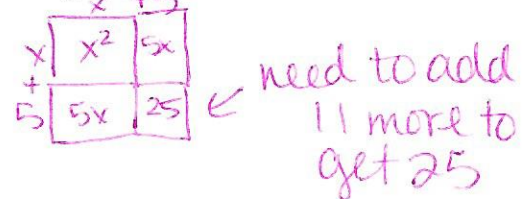
Diagram:



11.  $f(x) = x^2 + 10x + 14$

Perfect square? no

Diagram:



Product of binomials (side lengths):

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

Product of binomials (side lengths):

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

Product of binomials (side lengths):

$(x+5)(x+5) = +11$

$(x+5)^2 = 11$   
 $(x+5)^2 - 11 = 0$

Multiply the following binomials. Use a diagram to help you.

12.  $(x + 4)(x + 1)$

$$\begin{array}{r} x^2 + x + 4x + 4 \\ x^2 + 5x + 4 \end{array}$$

13.  $(x + 6)(x - 2)$

$$\begin{array}{r} x^2 - 2x + 6x - 12 \\ x^2 + 4x - 12 \end{array}$$

14.  $(x - 8)(x - 5)$

$$\begin{array}{r} x^2 - 5x - 8x + 40 \\ x^2 - 13x + 40 \end{array}$$

Factor the following into a product of two binomials.

15.  $x^2 + 9x + 18$

$$(x+6)(x+3)$$

16.  $x^2 - 5x + 4$

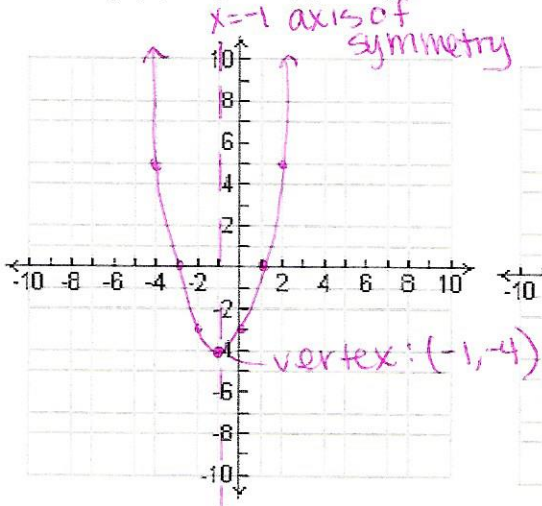
$$(x-4)(x-1)$$

17.  $x^2 + 2x - 15$

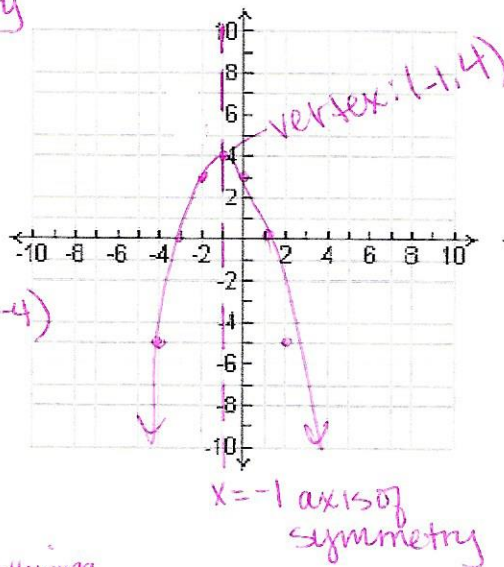
$$(x+5)(x-3)$$

Graph the following quadratic functions. Use a table of values or a graphing calculator to help you. Mark and label the axis of symmetry, the vertex, and two points on each side of the axis of symmetry.

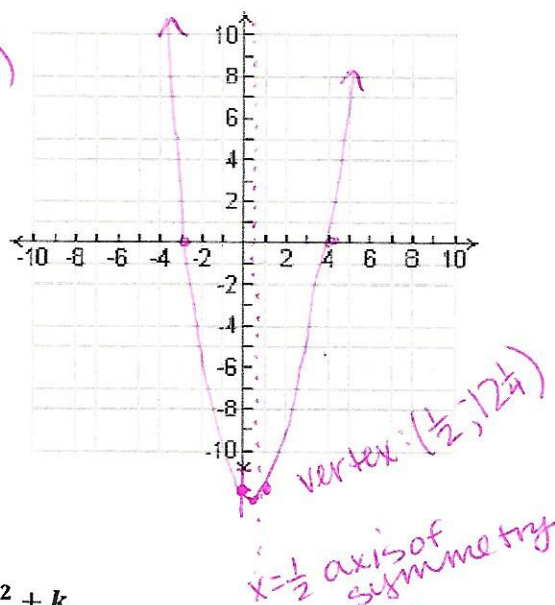
18.  $f(x) = (x - 1)(x + 3)$



19.  $f(x) = -(x + 1)^2 + 4$



20.  $f(x) = x^2 - x - 12 = (x-4)(x+3)$



Complete the square and get the following into vertex form,  $f(x) = a(x - h)^2 + k$ .

21.  $f(x) = x^2 + 10x + 13$

$$\begin{aligned} 0 &= x^2 + 10x + 13 \\ &\quad +12 \qquad \qquad +12 \\ &= x^2 + 10x + 25 \\ 12 &= x^2 + 10x + 25 \\ 12 &= (x+5)(x+5) \\ &\quad -12 \qquad \qquad -12 \\ 0 &= (x+5)^2 - 12 \\ f(x) &= (x+5)^2 - 12 \end{aligned}$$

22.  $f(x) = 2x^2 - 4x + 6$

$$\begin{aligned} 0 &= 2(x^2 - 2x + 3) \\ -4 &= 2(x^2 - 2x + 3 - 2) \\ -4 &= 2(x^2 - 2x + 1) \\ 0 &= 2(x-1)^2 + 4 \\ f(x) &= 2(x-1)^2 + 4 \end{aligned}$$

$x = \frac{1}{2}$  axis of symmetry  
need to subtract  $\frac{1}{2}$