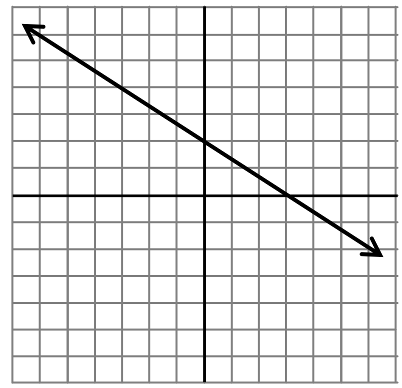
Building Polynomial Functions

NAME ____________________________



1. What is the equation of the linear function shown to the right?

2. How did you find it?

3. The slope – *y*-intercept form of a linear function is $y = mx + b$.
If you've written the equation in another form, rewrite your equation in slope – *y*-intercept form.

4. Now, factor out the slope, and rewrite the function as $y = m\left(x + \frac{b}{m}\right)$.

5. Choose a second linear function and write it in slope – *y*-intercept form.

6. Graph the function on the axis above, and be sure to label it.

7. Rewrite your second function with the slope factored out (just like you did in Question 4).

8. For each function, what does $\frac{b}{m}$ represent on the graph?

If you let $c = -\frac{b}{m}$, then the form $y = m(x - c)$ could be called the slope – *x*-intercept form of a linear equation, where c is the *x*-intercept. The factor theorem states that if c is a root (*x*-intercept) of a polynomial function, then $(x - c)$ must be a factor of that polynomial function. Note that $(x - c)$ is a factor of the expression. The only other factor is the slope m.

9. From their slope – *y*-intercept form, multiply the two functions together.

10. Graph the resulting function on the same axis as the two lines on the previous page.

11. What kind of function did you get?

12. What relationship do you see between the graph from Question 10 and the lines?

- …and the *x*-intercepts?
- …and the *y*-intercepts?

13. Identify the left-most *x*-intercept on the graph. With a straight-edge, cover everything to the right of that point. What connections do you see relating the signs of the *y*-values?

14. Identify the right-most intercept on the graph. With a straight-edge, cover up everything to the left of that point. What connections do you see relating to the signs of the *y*-values?

Complete the following sentences.

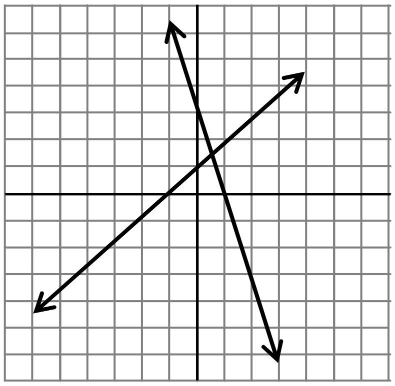
15. When both lines are **above** the *x*-axis, the *y*-values are ______________________ and the parabola __________________________.

16. When both lines are **below** the *x*-axis, the *y*-values are ______________________ and the parabola __________________________.

17. When one line is above the *x*-axis and the other is below the *x*-axis, the parabola __________________________.

y-VALUE OF L_1	*y*-VALUE OF L_2	PARABOLA IS ABOVE/BELOW THE *x*-AXIS
+	+	
+	-	
-	+	
-	-	

18. Based on the patterns you saw on the previous page, draw a sketch of the quadratic function that would be obtained from the linear expressions of these lines.



19. Write the equation for each line.

20. To check your sketch in Question 18, multiply the expressions together, and graph the resulting function on the grid above. How accurate was your sketch?