CCGPS Adv Alg – 203: Shaping Polynomial Functions Name: ________________________

Two characteristics of a polynomial function that we discussed on Tuesday work together to determine the function's shape: the degree and leading coefficient. These will be your main clues to determining the function's **end behavior**, which describes the function's behavior as *x* gets closer to negative or positive infinity. Think back to the parent functions of the first 6 degrees of polynomials, which we looked at on Tuesday.

(1) If the degree was odd, did the graph of the function point in the same direction vertically (like a u-shape), or different directions?

(2) What about when the degree was even?

Now this would be easy enough, but there's one more twist. The leading coefficient can change the direction of our function tails. For example, think back to Math 1… how was the graph of $y = -x^2$ different from the graph of $y = x^2$?

(3) What happens when the leading coefficient is negative instead of positive?

This leads us to our first understanding, and it is one that you know, that seems completely obvious, but is often overlooked and forgotten. You should be able to know the end behavior of any function within 3 seconds of looking at it (just the function, not even the graph). Here are the end behaviors of polynomial functions, summarized in a nice table.

End Behaviors of Polynomial Functions

	Leading Coefficient			
Degree	Positive		Negative	
Odd	Left tail » –∞	Right tail » ∞	Left tail » ∞	Right tail » –∞
Even	Left tail » ∞	Right tail » ∞	Left tail » –∞	Right tail » –∞

Determine the end behavior of the following polynomial functions:

#	*f(x)*	Degree	LC	Left Tail	Right Tail
1	$2x^3 + 5x - 3$				
2	$-x^4 + 3x^3 + 10x + 1$				
3	$5x - 3$				
4	$-3x^3 - 3$				
5	$2x^{10} + x^6 - 11$				
6	$0.6x^7 + 2x^3 - 2$				
7	$-4x^8 + 5x^4 - 6x^2 - 7x$				
8	$-2x^3 + 5x - 3$				
9	$x^{5.4} + 5x - 3$				
10	$-\frac{1}{5}x^7 + 5x - 3$				

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Another concept we can discuss today is finding the *y*-intercept of a polynomial function. You should remember that the trick to getting the *y*-intercept is to let ___ equal ___ ___ ___ ___ in the function. This works because the *y*-intercept is where the function crosses the *y*-axis. One thing you know about every point on the *y*-axis is that the *x*-coordinate is 0.

(11) Use the space below to find the *y*-intercept of each of the functions on the other side of the page.

(12) What did you notice about the *y*-intercepts?

Let's use our skills to practice sketching those 9 functions (skip the tricky one). In the coming weeks, we will be able to make much more accurate sketches, but for now just try to get the end behavior and intercept correct.