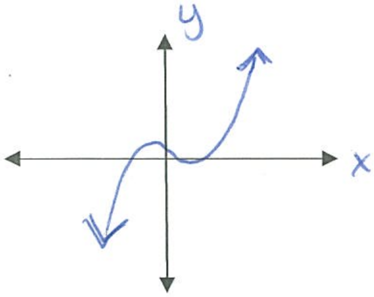
Algebra 3-4 Name:________________________________

IF.6 Polynomial End Behavior Discovery Period :___________

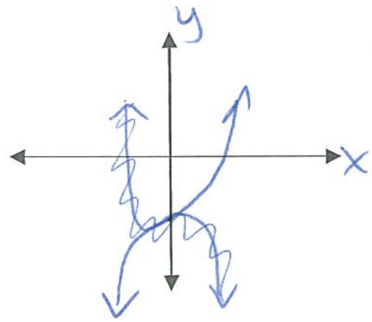
This worksheet will guide you through looking at the end behaviors of several polynomial functions. At the end, we will generalize about all polynomial functions. A good window for all the graphs will be [-10, 10] x [-25, 25] unless stated otherwise. Try to mimic the general shape and the end behavior of the graphs. However, you do not need to be very accurate as to where the x and y intercepts are.

Label the x and y axes. Sketch the graph of each function on the three planes below.

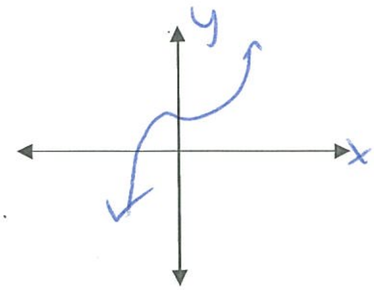
1. $f(x) = 2x^3 + 4x$



2. $f(x) = 3x^5 - 6$



3. $f(x) = x^7 + 2x^3 - 5x^2 + 2$



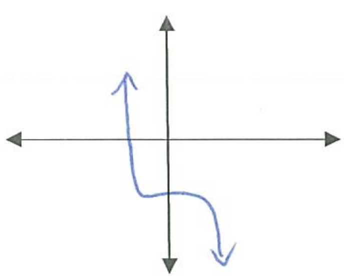
In words, describe what is happening to each graph on the :

1.	2.	3.
Far Left: down	Far Left: down	Far Left: down
Far Right: up	Far Right: up	Far Right: up

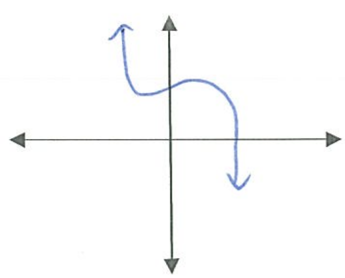
Using mathematical notation describe what is happening to the graph :

1.	2.	3.
$as\ x \to -\infty, f(x) \to$ $-\infty$	$as\ x \to -\infty, f(x) \to$ $-\infty$	$as\ x \to -\infty, f(x) \to$ $-\infty$
$as\ x \to +\infty, f(x) \to$ ∞	$as\ x \to +\infty, f(x) \to$ ∞	$as\ x \to +\infty, f(x) \to$ ∞

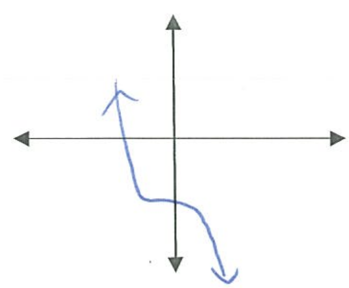
4. $f(x) = -3x^5 - 5x^2 + 3x - 4$



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



6. $f(x) = -x^7 + 2x^3 + 3x - 4$



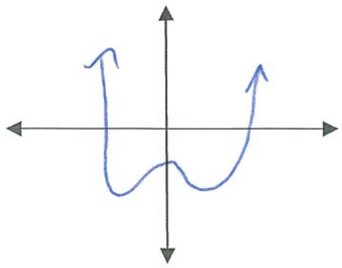
In words describe what is happening to the graph on the :

4.	5.	6.
Far Left: up	Far Left: up	Far Left: up
Far Right: down	Far Right: down	Far Right: down

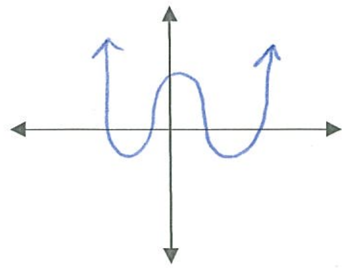
Using mathematical notation describe what is happening to the graph :

4.	5.	6.
$as\ x \to -\infty, f(x) \to$ ∞	$as\ x \to -\infty, f(x) \to$ ∞	$as\ x \to -\infty, f(x) \to$ ∞
$as\ x \to +\infty, f(x) \to$ $-\infty$	$as\ x \to +\infty, f(x) \to$ $-\infty$	$as\ x \to +\infty, f(x) \to$ $-\infty$

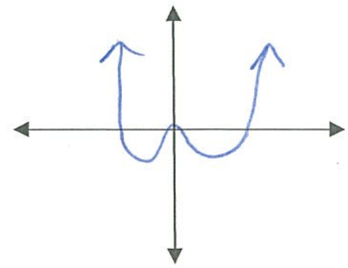
7. $f(x) = 2x^4 - 6x - 4$



8. $f(x) = x^4 - 11x^3 + 42x^2 - 64x + 32$



9. $f(x) = x^6 + 5x^5 - x^4 - 21x^3$



Set window to [-10,10] x [-50,75]

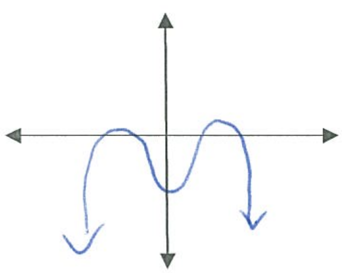
In words describe what is happening to the graph on the :

7	8	9
Far Left: up	Far Left: up	Far Left: up
Far Right: up	Far Right: up	Far Right: up

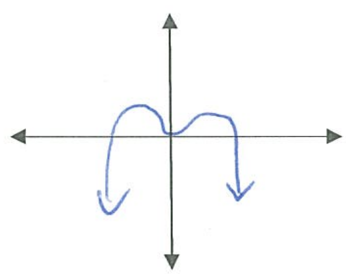
Using mathematical notation describe what is happening to the graph :

7	8	9
$as\ x \to -\infty, f(x) \to$ ∞	$as\ x \to -\infty, f(x) \to$ ∞	$as\ x \to -\infty, f(x) \to$ ∞
$as\ x \to +\infty, f(x) \to$ ∞	$as\ x \to +\infty, f(x) \to$ ∞	$as\ x \to +\infty, f(x) \to$ ∞

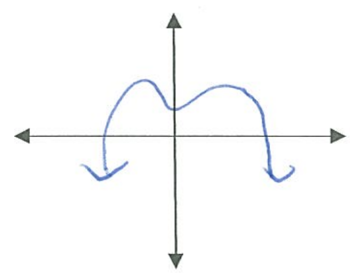
10. $f(x) = -2x^4 - 6x - 4$



11. $f(x) = -x^4 - 11x^3 + 42x^2 - 64x + 32$



12. $f(x) = -x^6 + 5x^5 - x^4 - 21x^3$



Set window to [-10,10] x [-50,75]

In words describe what is happening to the graph on the :

10	11	12
Far Left: down	Far Left: down	Far Left: down
Far Right: down	Far Right: down	Far Right: down

Using mathematical notation describe what is happening to the graph :

10	11	12
$as\ x \to -\infty, f(x) \to$ $-\infty$	$as\ x \to -\infty, f(x) \to$ $-\infty$	$as\ x \to -\infty, f(x) \to$ $-\infty$
$as\ x \to +\infty, f(x) \to$ $-\infty$	$as\ x \to +\infty, f(x) \to$ $-\infty$	$as\ x \to +\infty, f(x) \to$ $-\infty$

The two things that determine the end behavior of a polynomial are the degree (whether it's even or odd) and the leading coefficient (whether it's positive or negative). Look over your work for questions one through twelve to verify this. Use the table below to summarize the end behaviors of polynomials. Use mathematical notation.

	Negative Leading Coefficient	Positive Leading Coefficient
Odd Degree	Far left up Far right down	Far left down Far right up
Even Degree	Far left down down	Far right up up