Name: _____ Date: _____

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LESSON #5: END BEHAVIOR

Do Now:

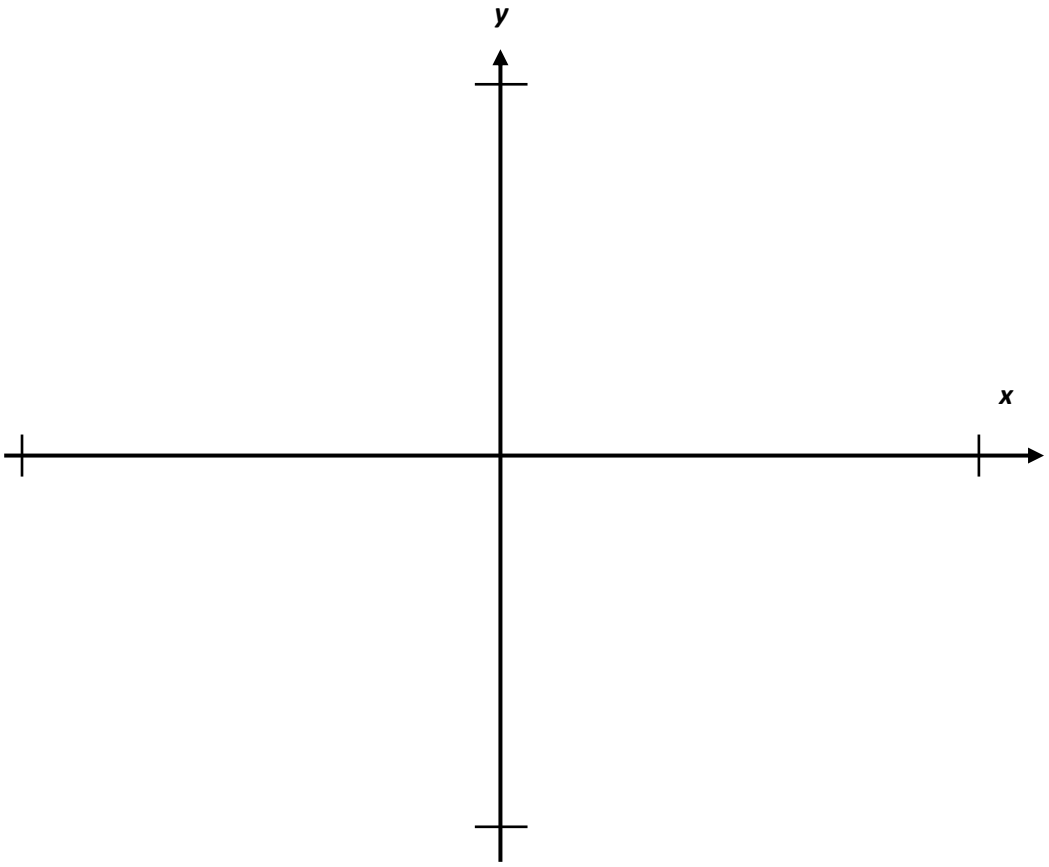
a) On the same set of axes, sketch AND label the graphs of $f(x) = x^2$ and $f(x) = x^4$.

b) **(DON'T SKETCH**) Predict what the graph of $f(x) = -x^2$ and $f(x) = -x^4$ look like?

c) On the axes shown, sketch AND label the graphs of $f(x) = x^3$.

d) On the same axes, sketch AND label $f(x) = -x^5$ and $f(x) = x^7$

e) Describe some similarities and differences between functions that have **even and odd** degrees.

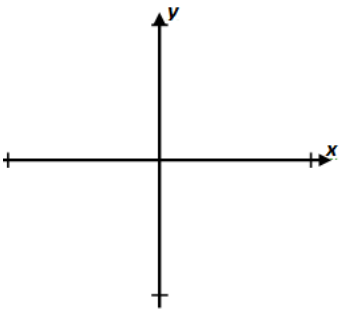


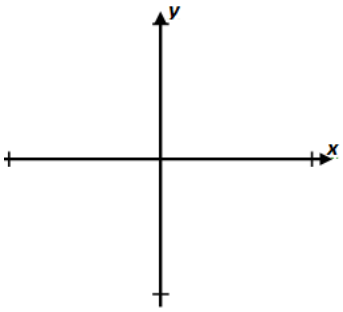
Use your calculator to graph each polynomial function below. Fill in the table paying attention to how the function **enters and exits** the view screen of the calculator.

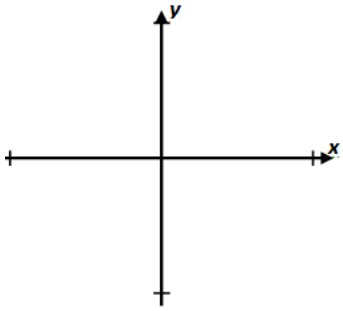
	Function	Even or Odd Degree	Positive or Negative Leading Coefficient	Rise or Fall to the left	Rise or Fall to the right
1)	$f(x) = 2x^2 - 3x + 3$				
2)	$f(x) = -x^4 + x^3 - x^2 + 3$				
3)	$f(x) = x^5 - x^3 + 2x + 6$				
4)	$f(x) = -x^3 + 2x^2 - x - 4$				

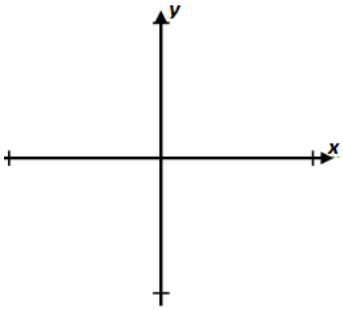
Sketch each of the 4 functions:

1) Even with + coefficient 2) Even with - coefficient 3) Odd with + coefficient 4) Odd with - coefficient









End Behavior (description): Let f be a function whose domain and range are subsets of the real numbers. The *end behavior of a function* f is a description of what happens to the values of the function:

- as x approaches _____ ***and***
- as x approaches _____

End behavior of Polynomial Functions:

EVEN DEGREE → Left and Right End Behavior is _____

ODD DEGREE → Left and Right End Behavior is _____

Find the end behavior of the function:

1) **$f(x) = x^4 - 4x^3 + 3x + 25$**

Degree:

Leading Coefficient:

End Behavior:

2) **$f(x) = -x^3 + 5x^2 - 1$**

Degree:

Leading Coefficient:

End Behavior:

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

Degree:

Leading Coefficient:

End Behavior:

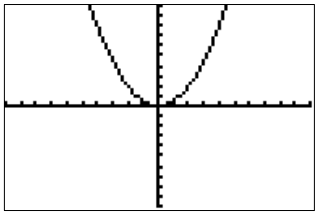
4) **$f(x) = -4x^4 + 5x^5 + x^2$**

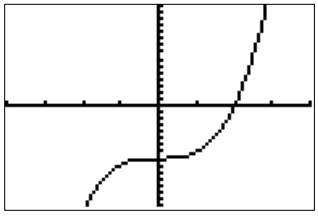
Degree:

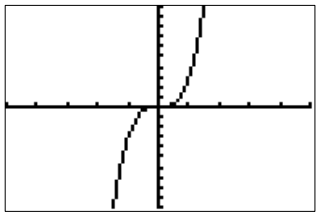
Leading Coefficient:

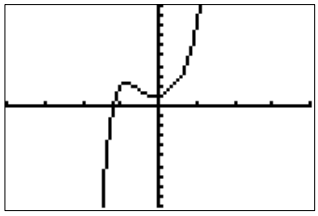
End Behavior:

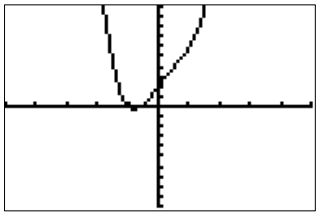
5) Without using a calculator, match each graph below in column 1 with the function in column 2 that it represents.

a. 

b. 

c. 

d. 

e. 

1. $y = 3x^3$

2. $y = \frac{1}{2}x^2$

3. $y = x^3 - 8$

4. $y = x^4 - x^3 + 4x + 2$

5. $y = 3x^5 - x^3 + 4x + 2$

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LAB #6: POLYNOMIAL DEGREE AND END BEHAVIOR

For #'s 1-5, write the degree and determine the end behavior (UP/DOWN) of each polynomial without a calculator.

1) $f(x) = -2x^3 + x$ Degree:_____ As $x \to -\infty$, graph goes _____ As $x \to +\infty$, graph goes _____	2) $f(x) = 3x^2 + 5x - 4$ Degree:_____ As $x \to -\infty$, graph goes _____ As $x \to +\infty$, graph goes _____
3) $f(x) = (x-1)(x^4 + 2x^3 - 3x^2 + 10)$ Degree:_____ As $x \to -\infty$, graph goes _____ As $x \to +\infty$, graph goes _____	4) $f(x) = -x^4 - 4x^2 + 1$ Degree:_____ As $x \to -\infty$, graph goes _____ As $x \to +\infty$, graph goes _____

5. Consider the function $f(x) = x^3 - 13x^2 + 44x - 32$.

a. Use the fact that $x - 4$ is a factor of f to factor this polynomial.

b. Find the x-intercepts for the graph of f.

6. The Center for Transportation Analysis (CTA) studies all aspects of transportation in the United States, from energy and environmental concerns to safety and security challenges. A 1997 study compiled the following data of the fuel economy in miles per gallon (mpg) of a car or light truck at various speeds measured in miles per hour (mph). The data is compiled in the table below.

A) This data can be modeled by a polynomial function. Determine if the function that models the data would have an even or odd degree.

B) Is the leading coefficient of the polynomial that can be used to model this data positive or negative?

Speed (mph)	Fuel Economy (mpg)
15	24.4
20	27.9
25	30.5
30	31.7
35	31.2
40	31.0
45	31.6
50	32.4
55	32.4
60	31.4
65	29.2
70	26.8
75	24.8