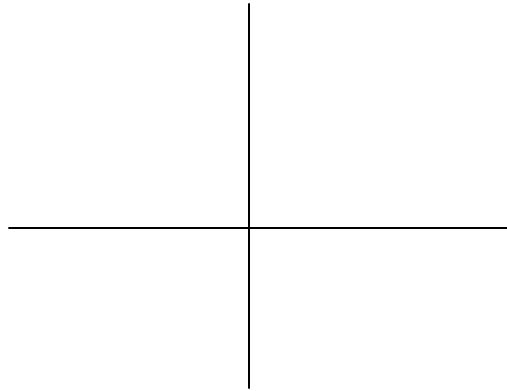


Connection between polynomial and power functions NAME:

We will investigate how the end behavior of a polynomial function can be simplified by looking at its leading term. On this worksheet, it is not necessary to get too critical of your graphs; we are particularly interested in the end behavior and not the minute details in between.

1. Graph $y = 3x^5 + 4x^3 + 5x + 4$ and $y = 3x^5$ on the same axes. Also, denote the end behavior they share.



2. Complete the table. The idea here is that we are looking at how each of the terms contributes to the total $3x^5 + 4x^3 + 5x + 4$. The easiest way to do this is to put the four functions $y_1 = 3x^5 + 4x^3 + 5x + 4$, $y_2 = 3x^5$, $y_3 = 4x^3$, and $y_4 = 5x$ into the **y=** editor. Then set your xMin and xMax to $[0, 100]$. Now select **Value** from the **Calculate** menu and put in an x value of 5. It will start by telling you the y value of **y1**. Press the **down arrow** and it will give you the y value of **y2**, continue in this fashion. (See notes on next page.) The column for the last term, 4, is done for you.

| x | Total $y = 3x^5 + 4x^3 + 5x + 4$ | $3x^5$ | $4x^3$ | $5x$ | 4 |
|------------|-------------------------------------|--------|--------|------|---|
| 5 | | | | | 4 |
| 10 | | | | | 4 |
| 20 | | | | | 4 |
| 50 | | | | | 4 |
| 100 | | | | | 4 |

Notes: On the **TI86** or **TI85**, the **EVAL** function (found by pressing **MORE** twice once you are on the graph screen) is the same as the **Value** function mentioned above.

Make sure you have the proper **xMin** and **xMax** entered. If the value of x is not contained in this interval, the **Value** or **EVAL** function will not work.

The calculator occasionally gives answers in scientific notation. For instance, the value for $y = 3x^5 + 4x^3 + 5x + 4$ when x is 100 is given as **3.0004E10**. Interpret this as 3.0004×10^{10} or 30,004,000,000. (Another example is 2.36E5 is interpreted as 2.36×10^5 or 236,000.)

3. Notice how the leading term $3x^5$ contributed much more to the total compared to the other three terms. Since the leading term contributes so greatly to the total, especially with large values of x , the end behavior of a polynomial function can be found by considering only the leading term. Go on to #4.

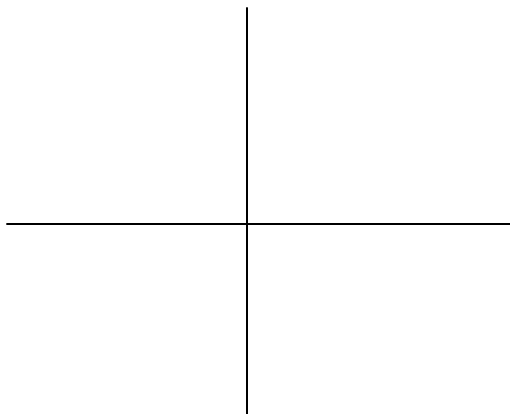
4. Consider the function $y = -5x^4 + 3x^3 - 7x + 9$. Answer the following questions.

a.) What is the leading term?

b.) Is the leading coefficient positive or negative? Is its degree even or odd?

c.) Using your knowledge of the end behavior of power functions, what do you think the end behavior of $y = -5x^4 + 3x^3 - 7x + 9$ is?

d.) Graph both $y = -5x^4 + 3x^3 - 7x + 9$ and $y = -5x^4$ on the axes below. Were you right? (You'll need to increase yMax to 15 or so.)



5. Consider the function $y = 10x^7 - 4x + 7$. Answer the following questions.

a.) What is the leading term?

b.) Is the leading coefficient positive or negative? Is its degree even or odd?

c.) Using your knowledge of the end behavior of power functions, what do you think the end behavior of $y = 10x^7 - 4x + 7$ is?

d.) Graph both $y = 10x^7 - 4x + 7$ and $y = 10x^7$ on the axes below. The standard window is fine. Were you right?

