ALGEBRA II ACTIVITY 8:
END BEHAVIORS OF POLYNOMIAL FUNCTIONS
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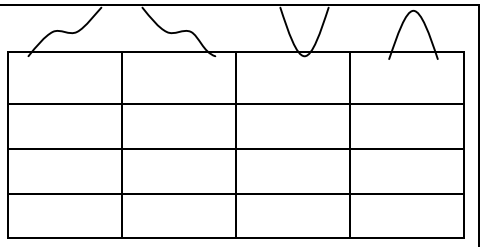
ACTIVITY OVERVIEW:
In this activity we will

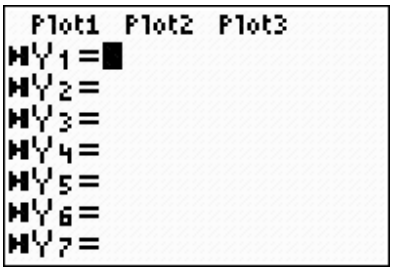
- Graph polynomial functions and categorize them by their end behavior
- Analyze how end behavior is affected by the lead coefficient and the exponent of the highest degree in the function



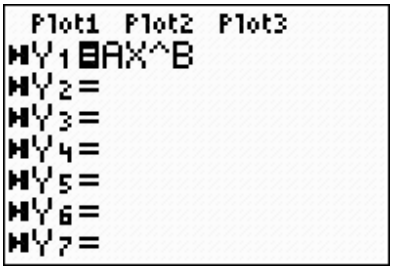
Create a large table like the one above. The four columns should be labeled with pictures representing the four types of end behaviors of polynomial functions.

Press [APPS] and press [ALPHA][4] to skip down to the T's. Select **:Transfrm** which is the Transformation Graphing Application.

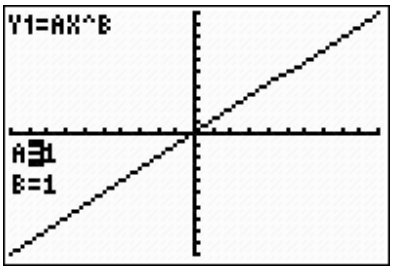
Press [Y=]. The icon to the left of each row indicates that the APP has been turned on.



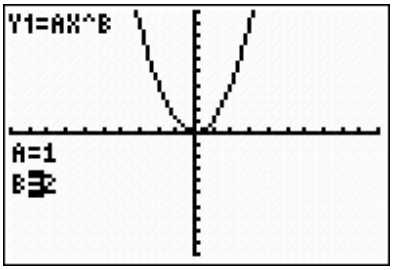
Enter the general form that will allow investigation of the simplest case, $f(x) = \pm x^n$. The APP will allow easy substitution of values for parameters represented by A, B, C, and D. See screen to the right.



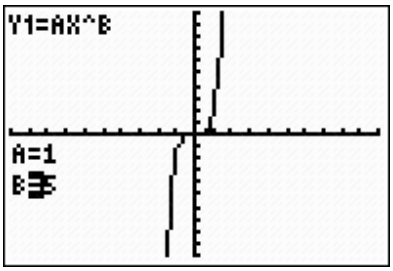
Press [GRAPH]. By default, both parameters A and B will begin with values of "1." What function is this? In what category of the table of end behaviors does this function fit? Record the equation in the table.



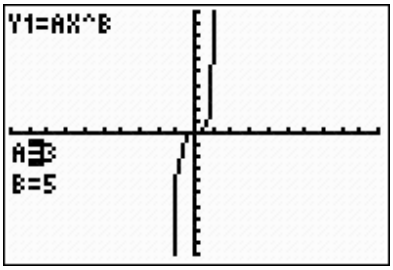
Arrow down to parameter B. To increase the degree of the function press ▶. Observe how the graph changes. What function is this? In what category of the table of end behaviors does this function fit? Record the equation in the appropriate column.



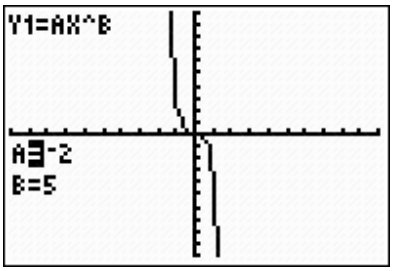
Continue to press ▶. Observe how the graph changes each time. Record the function in the appropriate column of the table of end behaviors. Does there appear to be a pattern to how the exponent affects end behavior?



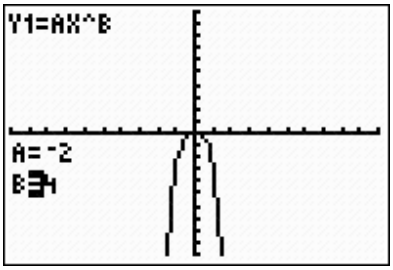
Arrow up to parameter A. Analyze the effect of the coefficient by pressing ▶ to increase the coefficient. Observe how the graph changes. What function is this? In what category of the table of end behaviors does this function fit?



Press ◀ to move the coefficient to a negative number. Observe how the graph changes. What function is this? In what category of the table of end behaviors does this function fit?

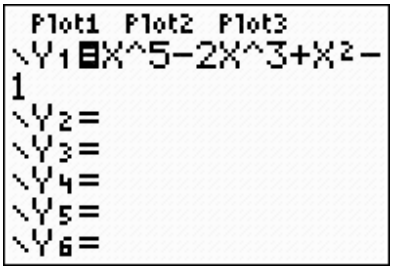


What happens when the coefficient is negative and the exponent is even?

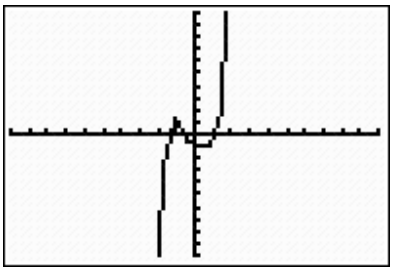


Before examining polynomial functions with more terms, turn off the Transformation Graphing APP. Press APPS ALPHA 4. Select **:Transfrm**. Select **1:Uninstall.**

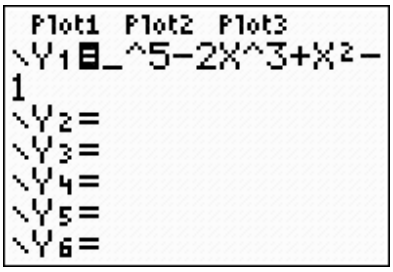
Investigate polynomial functions with several terms, such as the one shown.



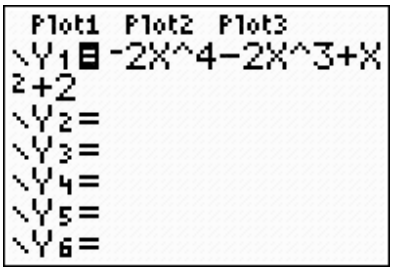
Analyze the graph and record the equation in the appropriate column.



To edit the equation in Y1 by putting a sign or coefficient in front of existing terms, press [2nd][DEL] to insert. Type the information to insert. To remove terms, move to them and press [DEL].



Continue to experiment with various equations.



Record them in the table according to their end behavior.

What parts of the equations control end behavior? Do the exponents of other terms affect end behavior? What happens when the highest degree exponent is even? Odd? What happens when the leading coefficient is positive? Negative? What other patterns did you notice? What do you think would happen if the highest degree exponent was negative?