End Behavior and Zeros of Polynomial Functions Discussion

Polynomial functions have distinctive characteristics that help us understand their behavior across different domains. Two key elements that define the shape of polynomial graphs are their end behavior (what happens as *x* approaches positive or negative infinity) and their zeros (where the function equals zero).

How to Proceed

Analyze a polynomial function: Choose ONE of the following polynomial functions to analyze:

1. $f(x) = -2x^3 + 3x^2 + 12x - 5$
2. $f(x) = x^4 - 8x^2 + 16$
3. $f(x) = 3x^5 - 15x^4 + 10x^3 + 30x^2 - 20x - 8$
4. $f(x) = -x^6 + 3x^4 - 2x^2 + 5$

For your chosen function:

1. Identify the degree and leading coefficient of the polynomial
2. Determine the end behavior of the function using the degree and leading coefficient
3. Find all real zeros of the function (you may use technology to help with this)
4. For each real zero, determine its multiplicity and explain how the graph behaves at that zero
5. Create a graph of the function that clearly shows all zeros and the end behavior
6. Based on the degree of the polynomial, what is the maximum number of turning points the function could have? Identify all turning points visible on your graph.

Create your post: Share your analysis in a well-organized post that includes:

1. An introduction identifying which function you selected and a brief overview of the key features you'll be discussing
2. A step-by-step analysis addressing each of the required elements above
3. A clearly labeled graph showing the polynomial function
4. A brief explanation of how the end behavior and zeros work together to create the overall shape of the graph
5. Any calculations or work you did to find the zeros

Engage with your classmates: After posting your analysis, review your classmates' posts and respond to at least two of them. In your responses, consider:

- How the end behavior of their function compares to yours
- Similarities or differences in the methods used to find zeros
- Questions about their approach or results
- Observations about patterns you notice across different polynomial functions
- Any insights about how the degree and leading coefficient affect the appearance of the graph

Your responses should be thoughtful and engage with the mathematical concepts in your classmates' posts, helping to deepen everyone's understanding of polynomial functions and their behavior.

Ensure your posts are submitted by [insert due date here].

This assignment is required and worth up to 20 points. See the grading rubric below.

Rubric:

Criteria	Proficient	Developing	Not Evident	Points
Mathematical Analysis	Accurately identifies the degree, leading coefficient, end behavior, zeros, and their multiplicities. Graph is correctly drawn with all key features clearly marked. Mathematical terminology is used precisely throughout.	Identifies most components with minor errors in calculations or interpretations. Graph contains key features but may have minor inaccuracies or incomplete labeling. Terminology is mostly correct with minor misuse.	Multiple significant errors in identifying key components. Graph is missing, severely inaccurate, or lacks necessary features and labels. Significant misuse of mathematical terminology.	___/7
Conceptual Understanding	Demonstrates thorough understanding of how end behavior relates to degree and leading coefficient, and how multiplicity affects graph behavior at zeros. Clearly explains the connection between algebraic properties and graphical features.	Shows basic understanding of end behavior and zeros, but explanations may lack depth or contain minor misconceptions. Connection between algebraic and graphical representations is present but not fully developed.	Shows limited understanding of the relationship between polynomial properties and graphical features. Explanations contain significant conceptual errors or are missing entirely.	___/6
Presentation	Post is exceptionally well-organized, clearly written, and free from major grammatical errors. All parts of the assignment are thoroughly addressed with appropriate mathematical notation.	Post has an understandable structure but may lack clarity in some areas. Most parts of the assignment are addressed but some sections may lack depth. Some minor grammatical errors or awkward phrasing may be present.	Post is disorganized or difficult to follow. Multiple parts of the assignment are missing or severely underdeveloped. Significant grammatical errors impede understanding.	___/3

Peer Engagement	Provides at least two thoughtful responses that demonstrate engagement with peers' mathematical analyses. Responses offer meaningful comparisons, ask insightful questions, or provide new perspectives that extend the discussion.	Provides at least two responses that show some engagement with peers' work but may lack depth or mathematical insight. Some attempt to compare or question, but contributions are somewhat superficial.	Provides fewer than two responses, or responses are minimal and do not meaningfully engage with the mathematical content of peers' posts.	___/4
Total				___/20