Section 3.2 Polynomial Functions of Higher Degree

Objective: In this lesson you learned how to sketch and analyze graphs of polynomial functions.

I. Graphs of Polynomial Functions (Pages 271–272)

Name two basic features of the graphs of polynomial functions.

1) ____________________________
2) ____________________________

Will the graph of \( g(x) = x^7 \) look more like the graph of \( f(x) = x^2 \) or the graph of \( f(x) = x^3 \)? Explain.

II. The Leading Coefficient Test (Pages 273–274)

State the Leading Coefficient Test.

Example 1: Describe the right-hand and left-hand behavior of the graph of \( f(x) = 1 - 3x^2 - 4x^6 \).
III. Zeros of Polynomial Functions (Pages 275–277)

On the graph of a polynomial function, turning points are . . .

Let \( f \) be a polynomial function of degree \( n \). The graph of \( f \) has, at most, \( \frac{n}{2} \) turning points. The function \( f \) has, at most, \( n \) real zeros.

Let \( f \) be a polynomial function and let \( a \) be a real number. List four equivalent statements about the real zeros of \( f \).

1) 
2) 
3) 
4) 

If a polynomial function \( f \) has a repeated zero \( x = 3 \) with multiplicity 4, the graph of \( f \) touches but does not cross the \( x \)-axis at \( x = 3 \).

If a polynomial function \( f \) has a repeated zero \( x = 4 \) with multiplicity 3, the graph of \( f \) crosses the \( x \)-axis at \( x = 4 \).

**Example 2:** Sketch the graph of \( f(x) = \frac{1}{4}x^4 - 2x^2 + 3 \).

IV. The Intermediate Value Theorem (Pages 278–279)

Explain what the Intermediate Value Theorem implies about a polynomial function \( f \).

Describe how the Intermediate Value Theorem can help in locating the real zeros of a polynomial function \( f \).