3.4 Equations and Graphs of Polynomial Functions

Warm Up:

1) When the polynomial \( mx^3 - 3x^2 + nx + 2 \) is divided by \((x+3)\), the remainder is -1. When it is divided by \((x-2)\) the remainder is -4. What are the values of \( m \) and \( n \)?

2) Factor fully. \( x^4 + x^3 - 10x^2 - 4x + 24 \) then answer these questions.

- Leading Coefficient
- \( y \)-intercept
- End behavior
- \( x \)-intercepts

Ex 1: Graph and analyse the function \( f(x) = (x+3)(x+4)(x+1) \)

- Leading Coefficient \((x)(x)(x) = x^3\)
- \( y \)-intercept
- End behavior
- \( x \)-intercepts: \( x = -3, -4, -1 \)

To graph:
- Plot the \( x \)-intercepts, (Zeros)
- Plot the \( y \)-intercept
- Trace out the orientation.

Try this:

\[ y = (x-3)(x+4)(3-x)(x-2) = 0 \]

- \( x = 3, -4, 3, 2 \)
- \( (-3)(4)(3)(-2) = 120 \)
- QIII to QIV
Example 2: \( f(x) = (x+2)^2(x-4) \)

Multiplicity of 2.
There is going to be a bounce in the graph.

\( x-inter = -16 \)

Example 3: \( y = (3x+4)^2(x-4)^3 \)

Leading term: \( 9x^5 \)

\( y-inter = -1024 \)

\( x-inter: -4/3, -4/3, 4, 4, 4 \).

Bounce \( \uparrow \) slide \( \uparrow \)

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1-5 first, last, 7-10 first, last