Today's Objective

- Read a mathematical text using a reading guide in order to translate **between equivalent representations of zeros** and determine **the multiplicity of a zero** using key words.
- Success Criteria
  - Express zeros in terms of a solution to f(x)=0 $x=5$
  - Express zeros in terms of x-intercepts $(5,0)$
  - Determine the factors of a polynomial $(x-4)^4$
  - Identify the multiplicity of a zero
  - Determine whether an x-intercept crosses the x-axis
- Vocabulary: zero, factor, solution, x-intercept, multiplicity

Multiplicity of a Zero of a Polynomial Function

If f is a polynomial function and $(x-c)^m$ is a factor of f but $(x-c)^{m+1}$ is not, then c is a zero of **multiplicity *m*** of f.

Example **Sketching the Graph of a Factored Polynomial**

Sketch the graph of $f(x) = (x+2)^3(x-1)^2$.

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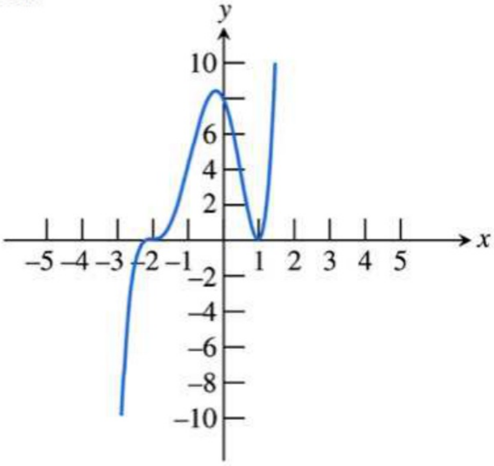
Sketch the graph of $f(x) = (x+2)^3(x-1)^2$.

The zeros are $x = -2$ and $x = 1$. The graph crosses the x-axis at $x = -2$ because the multiplicity 3 is odd. The graph does not cross the x-axis at $x = 1$ because the multiplicity 2 is even.



Equivalent Expressions

Factor	x-intercept	Solution	Zero/Root
(x-k)	(k, 0)	x = k	k
(x+k)	(-k, 0)	x = -k	-k

Factor	x-intercept	Solution	Zero/Root
x+7	(-7, 0)	x = -7	-7
(x-4)	(4, 0)	x=4	4

Today's Objectives

- Orally describe **the process of long division** using the key words quotient, remainder, and dividend. Label each key word **in your mathematical work** using color-coded notes and visual diagrams.
- Success Criteria
  - Decipher the meaning of the division algorithm
  - Use long division to divide polynomials
- Vocabulary: Quotient, Remainder, Dividend

Division Algorithm for Polynomials

Let $f(x)$ and $d(x)$ be polynomials with the degree of f greater than or equal to the degree of d, and $d(x) \neq 0$. Then there are unique polynomials $q(x)$ and $r(x)$, called the **quotient** and **remainder**, such that $f(x) = d(x) \cdot q(x) + r(x)$ where either $r(x) = 0$ or the degree of r is less than the degree of d.

The function $f(x)$ in the division algorithm is the **dividend**, and $d(x)$ is the **divisor**. If $r(x) = 0$, we say $d(x)$ **divides evenly** into $f(x)$.