First of all...what is a polynomial?

3x^4 + 5x^2 – 6  The sum of one or more terms.

What is the purpose of a polynomial in real life application?
- reduce or double a recipe
- speed of a body varies linearly in time
- soft iron in a mild magnetic field
- wind the [propeller] of a toy rubber-band airplane
- depend[s] on what the person analyzing the set finds to work best
- Babylonian taxes
  - described the orbits along which the planets moved round the Sun
  - shape of Galileo's telescope used lenses which was formed by two intersecting hyperbolae
  - reflecting telescope, invented by Newton has a mirror for which each cross section takes the shape of a parabola! So does the giant radio telescope, a shaving mirror and a satellite TV dish
  - the link between quadratic equations and acceleration
  - braking force applied to a car
  - science of ballistics
  - predict the motion of the elections and holes in semi-conductors for computers, cars, DVD players, and mobile phones

Why factor polynomials?
To...see more deeply into the pattern.

Multiplicity of a Root
Example: f(x) = (x-2)^2(x-4)^3
(x-2) has even multiplicity, so it just touches the axis at x=2
(x-4) has odd multiplicity, so it crosses the axis at x=4
Like this:

Why does the rational zero theorem work?

f(x) = a_n \cdot x^n + a_{n-1} \cdot x^{n-1} + ... + a_1 \cdot x + a_0
The rational root theorem says that if you have a rational root of f(x), call it \( \frac{p}{q} \), then p divides a_0 and q divides a_n.
Which would mean 0 = f\left(\frac{p}{q}\right).

Why can't some polynomials be solved?
This is not a simple result...until the 1820s,...first Abel demonstrated it was impossible, and then Galois worked out the entire theory of solvable polynomials.

But Some Roots May Be Complex
If we can't solve a fifth-order polynomial with algebra, is there any way to solve it? ...[I]t's called iterative approximation.
The absence of algebraic solutions to fifth-order and higher polynomials is a not a feature of mathematics, but instead is a consequence of the arbitrary human decision to represent some iterative, approximating procedures with shorthand symbols, but not others.

Next questions: Who is Niels Henrik Abel and what was his proof?  What did Evariste Galois have to add to the proof?  What is the fourth dimension?  Application to classroom: Beginning with graphs, students can solve polynomials.  Then they can study the connections among the different representations.  Why this question: I have taught the rational zero theorem for a few years now and wanted to know more about its history.
9. http://answers.yahoo.com/question/index;_ylt=A0LEVVUopRFMiD4AerIPxQt.;_ylu=X3oDMTEzdDNxMXZyBHNlYwNzcgRwb3MDQARj2xfA3JlNA
R2dGlkAwRsA1dTMQ--?qid=20071208102840AA8PwTD