Polynomials as Models
Algebra 2

Goals:
1. Describe graphically, algebraically and verbally real-world phenomena as functions; identify the independent and dependent variables. (3.01)
2. Use polynomial equations to solve problems. Solve by graphing. (3.07)
3. Find zeros, intercepts, and approximate turning points of polynomial functions; describe them in the context of the problem. (3.08)
4. Use systems of two or more equations to solve problems. Solve by using matrix equations of the form AX=B. (3.12)
5. Operate with matrices to solve problems. Find the inverse of a matrix. (4.04)

Materials and equipment needed for each student:
1. Copy of the student handout
2. Graphing calculator
3. Paper and pencil for note taking

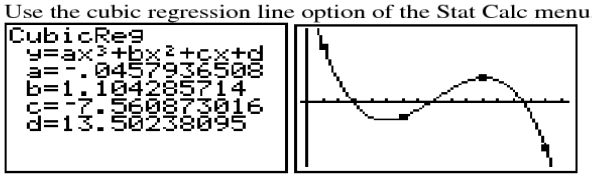
Activity One: Look before you leap. Be sure to read the question.

This question is taken from the Algebra 2 Indicators: problem 3.12 B. This problem was developed by the NC State Department of Education as an example of a kind of question for the End of Course Test.

(1,7), (6,-2), (11,3), and (15,-6) are points on the graph of $y = ax^3 + bx^2 + cx + d$. Using matrix equations of the form $AX = B$, set up the matrix equation to determine a, b, c, and d. What is the equation? What is A^{-1}?

This question implies that if we have four points we can find a cubic function that passes through these points. After the examples done above, data analysis looks like a good option. Put the $x-$ values of the points in L1 and the $y-$ values of the points in L2.

Use the cubic regression line option of the Stat Calc menu. This gives the polynomial:



However, this is not what the question asks. We need to set up a matrix equation. To do this we must substitute each ordered pair in the equation to create a new equation that connects the variables *a*, *b*, *c*, and *d*. The four resulting equations are:
$7 = a + b + c + d$ for the point (1,7)
$-2 = 216a + 36b + 6c + d$ for the point (6,-2)