Name: ______________________ **Precalculus Unit 4, Lesson 7**

Aim: How can we "put it all together"? (Using zeros to help graph polynomial functions)

I. Do Now:

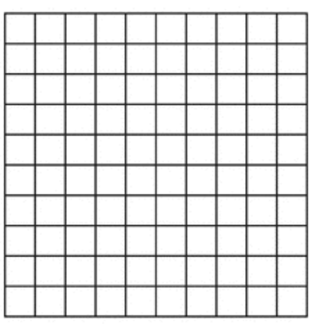
1. Factor completely:
   $x^4 - 8x^2 - 9$

2. Find a polynomial function with the given roots:
   (a) 0, 3, 6
   (b) $-\frac{1}{2}, 4$

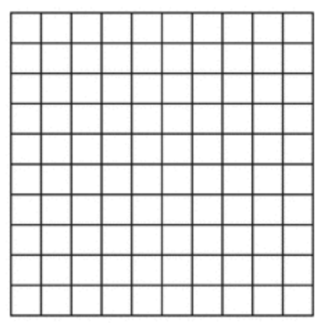
3. Given $9x^3 - 18x^2 - 16x + 32$
   (a) Use synthetic division to divide the polynomial by $x - 2$.
   (b) Find all zeros of the polynomial $f(x) = 9x^3 - 18x^2 - 16x + 32$

II. Graphing polynomial functions using the techniques we have learned.

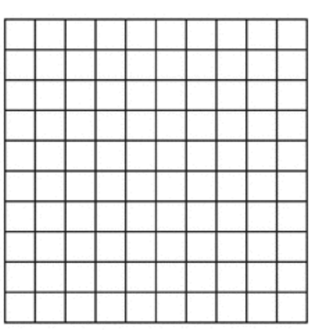
4. Graph $f(x) = x^3 - 4x^2 + x + 6$.
   (a) Find all zeros (without calculator). (*Hint:* 3 is a zero of the function.)
   (b) Use your graphing calculator to find the coordinates of the turning points.
   (c) Plot and connect the points.



5. Graph $f(x) = -2x^4 + 4x^3 - 2x^2$.
   (a) Find all zeros (without calculator).
   (b) Use your graphing calculator to find the coordinates of the turning points.
   (c) Plot and connect the points.



6. Graph $f(x) = x^3 - x^2 - 5x + 2$.
   (a) Find all zeros to the nearest tenth. (*Hint:* There is at least one rational root.)
   (b) How can you use synthetic division to determine where the roots are located?
   (c) Use your graphing calculator to find the coordinates of the turning points.
   (d) Plot and connect the points.



7. Challenge:
   (a) Find the <u>sum</u> of the roots for each of the previous problems.
   (b) Find the <u>product</u> of the roots for each of the previous problems.
   (c) Consider a general polynomial function of degree *n*:
   $f(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \cdots + a_0$
   (i) Find a rule for the sum of its roots.
   (i) Find a rule for the product of its roots.

HW30
- p. 110: 35, 36, 51, 53, 66, 68, 69
- Use the roots and end behavior to sketch graphs of each (on separate axes):
  (a) $f(x) = x^3 - 9x$
  (b) $f(x) = x^3 + 3x^2 - 9x - 27$