5.3 Roots and Graphs of Polynomials using Graphing Calculator

- I can identify the least degree of a function.
- I can use a calculator to find the zeros and min/max of a polynomial function.
- I can use a calculator to solve real-life applications using polynomial functions.

Zeros/Roots: The values that make a function equation ___Zero___

The __X__ intercepts of the graph of the function.

Local maximum or local minimum: The turning points of a function. Where the function changes direction. Sometimes they are not <u>the</u> highest or <u>the</u> lowest points but are the highest or lowest points in the area
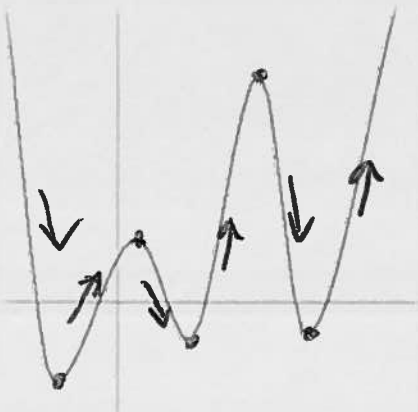

Degree = (number of ___real zeros/roots___) + (number of ___nonreal zeros/roots___)

Least degree of a function: Number of ___turning points___ + 1
Or number of directions of the graph (up, down, up down --> 4 directions so at least a degree of 4)

Find the least degree of the following polynomial functions.
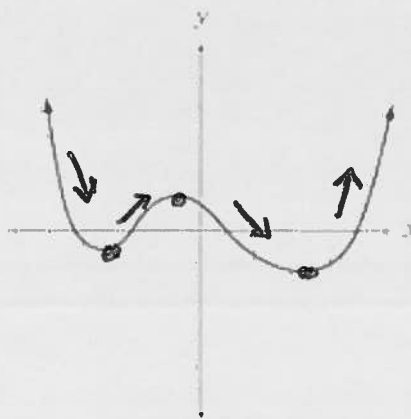
Ex. 1

5 turning pts +1 = 6
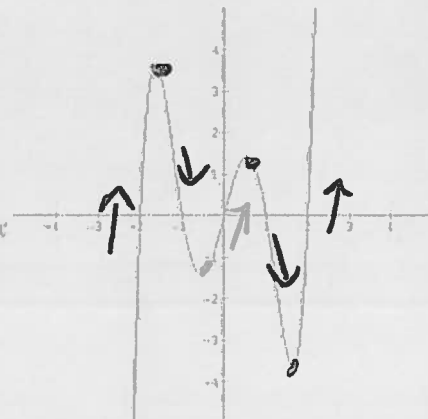
[6] at least

or 6 directions

Ex. 2
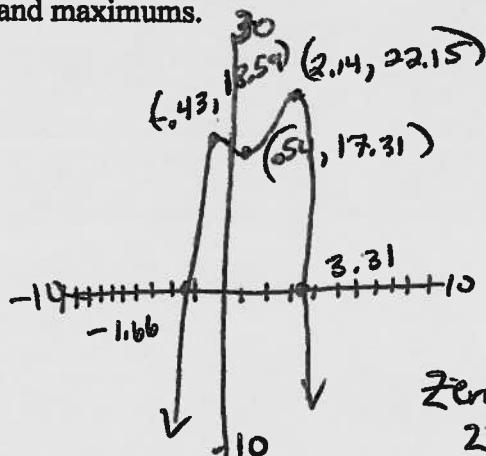

3 + 1

or 4

Ex 3.

4 + 1 =
5

Ex. 4

With the function $f(x) = -x^5 + 9x^3 - 12x + 18$ use a calculator to find zeros and local minimum and maximums.

Zeros: $-1.66, 3.31$

2 nonreal zeros

local max: 18.59 and 22.15

local mm: 17.31

- Graph in calculator (start with zoom: 6 standard)
- Based upon degree and leading coefficient or domain given in a problem, adjust window to see the turning points. (the table can help to know how much to adjust the graph)
- Use the calculate feature to find min/max and zeros.

Problem Asks for a Specific Amount

Ex 5 You are designing candle-making kits. Each kit will contain 25 cubic inches of candle wax and a mold for making a pyramid-shaped candle. You want the height of the candle to be 2 inches less than the length of each side of the candle's square base. What should the dimensions of your candle mold be if the equation for the volume of the mold is

$V(x) = \dfrac{1}{3}x^2(x-2)$ where x is the side of the base?
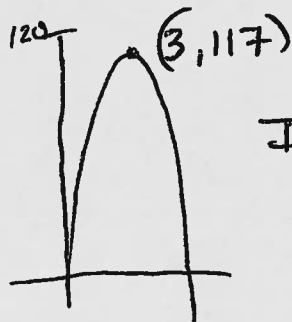
- Let the function equal the specific amount.
- Set the equation equal to zero.
- Graph and set a viewing window that has realistic x values.
- Find the zeros of the function (x intercepts).

$25 = \frac{1}{3}x^2(x-2)$

$0 = \frac{1}{3}x^2(x-2) - 25$

find zero on graph

$x = 5$ is the zero

dimensions: length: 5
height: $5 - 2 = 3$

Problem Asks for a Maximum or Minimum Amount

Ex 6 The concentration of a drug (in parts per million) in a patient's bloodstream t hours after administration of the drug is given by the function : $P(t) = -t^4 + 12t^3 - 58t^2 + 132t$ How many hours after administration will the drug be most effective and reach its maximum?

- Graph and set a viewing window that has realistic x and y values.
- Remember that the table can help to set the window.
- Find the max or min on the graph.

**If Quadratic you can find the vertex by completing the square or x=-b/2a. This can be MUCH easier than using the graph.

(3,117)

It will be most effective after 3 hours.

Do & Discuss

From the information in the previous example determine how many hours after administration will the drug be at 50 parts per million?
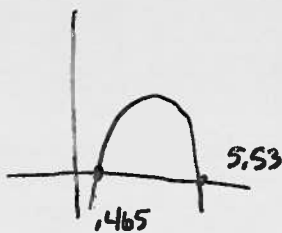
after .47 hours and after 5.53 hours.

Additional resources: video tutorial finding min/max and zeros on a TI calculator.
https://www.youtube.com/watch?v=xDuKybyyYJA