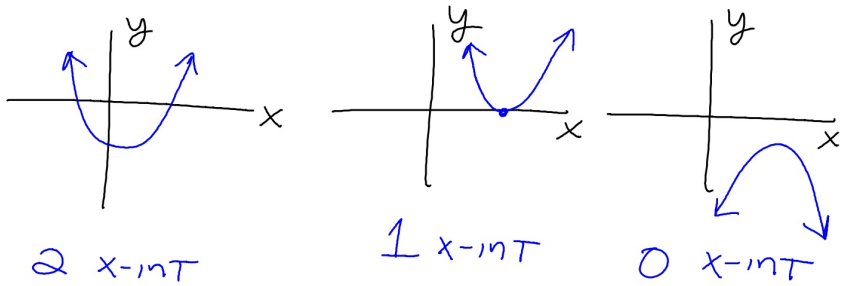
Agilemind - Topic 5 - Analyzing Polynomial Functions

Exploring "Long-term Behavior and Real Zeros"

Pages 1 & 2

How many times would you expect a quadratic graph to intersect the x-axis?



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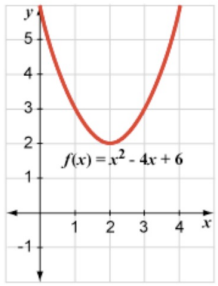
Answer question #4 on SAS3

4. Use the quadratic formula to find the roots of $x^2 - 4x + 6 = 0$.



a = 1
b = - 4
c = 6

$b^2 - 4ac = 16 - 4(1)(6) = -8$

$\sqrt{-8} = \sqrt{-4} \cdot \sqrt{2} = 2i\sqrt{2}$

$$x = \frac{4 \pm \sqrt{-8}}{2} = \frac{4 \pm 2i\sqrt{2}}{2} = 2 \pm i\sqrt{2}$$

Since these roots are imaginary they won't appear on the graph as x-intercepts. This is why the graph doesn't intersect the x-axis.

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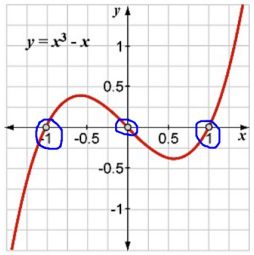
Answer question #5 on SAS3

5. Consider the cubic polynomial $f(x) = x^3 - x$. Notice that each term has a common factor of x. Use this information to factor the polynomial.



$x^3 - x$ GCF = x

$= x(x^2 - 1)$ difference of perfect squares: $(x^2 - 1) = (x+1)(x - 1) = (x \pm 1)$

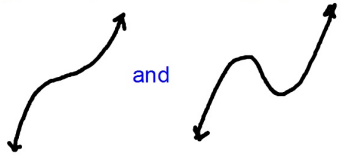
$= x(x \pm 1)$

Zeros are: x = 0,±1

Since these are real zeros they all appear on the graph as x-intercepts.

How many times would you expect a cubic graph to intersect the x-axis?

The classic cubic shapes



and

indicate that a cubic must cross the x-axis at least once and possibly up to three times.

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How many maximum or minimum values might you expect a quadratic have?

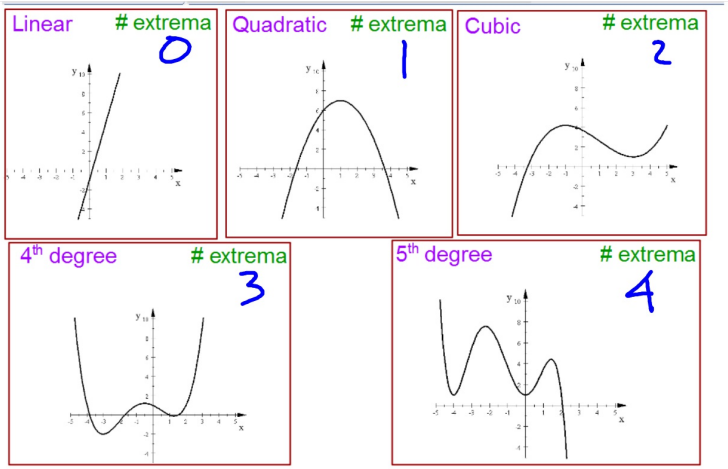
Either One Absolute Max or Min. No Relative Max's or Min's.

How many maximum or minimum values might you expect a cubic to have?

Never will have either an Absolute Max nor an Absolute Min but it might have a Relative Max and Min.

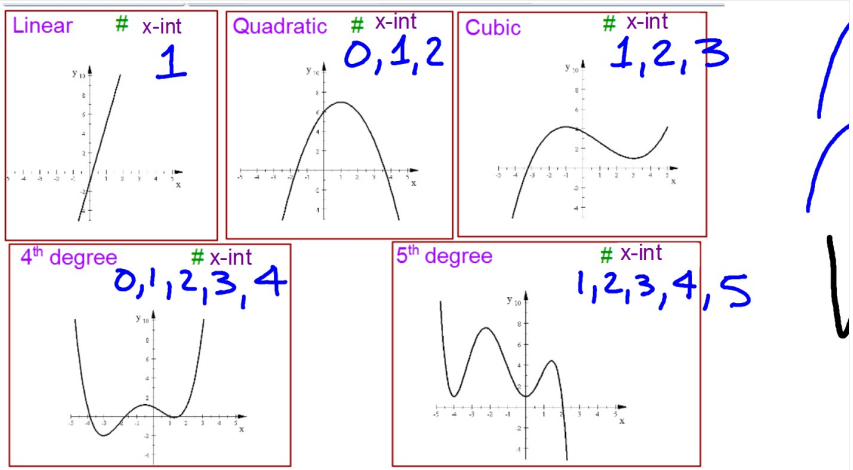
Together, Absolute and Relative Max's and Min's are called

Extremes or Extrema



Number of extrema of a polynomial:

If the degree of the polynomial is n
then there can be up to n-1 extrema.



x-intercepts of a graph are also called:

- Real Zeros
- Real Roots

X - Intercepts -- Can have up to n x-intercepts.
n = degree of polynomial

EVEN Functions may have no x-intecept or multiple x-intercepts.
ODD Functions must have at least 1 x-intercept

Y - intercepts -- All polynomials have exactly ONE y-intercept.

Every polynomial equation has exactly n solutions, where n is the degree of the polynomial.

Some of these solutions may be imaginary so not all solutions can be found on a graph.