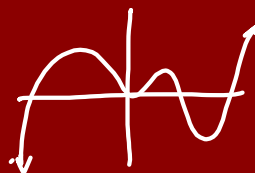


POLYNOMIAL + RATIONAL FUNCTIONS

Polynomial - many terms
- whole # exponents



Graph Characteristics

- 1) smooth, rounded turns
- 2) continuous - no holes, no asymptotes, no sharp pts

END BEHAVIOR

Degree = Highest power

Odd degree = ends go in opposite directions
even degree = both ends go in same direction

$$y = x^2$$

$$y = x^2 + 2x - 3$$

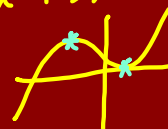
$$y = -2x^2 - 5x - 7$$

$$y = x^3$$

Negative leading coeff = ends switch directions

Maximum Number of Relative Extrema = Degree - 1

$$y = x^3 + 3x^2 - 5x + 1$$



Maximum Number of x-intercepts = Degree
(Solutions)

$$f(x) = 3x^5 + 7x^3 - 4x + 1$$

End Behavior



$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

$$\lim_{x \rightarrow +\infty} f(x) = +\infty$$

Max # of Rel Extr. = 4

Max # of (x-int) = 5
(real roots
real zeros)

$$f(x) = -3x^6 + 7x^5 - 28x^3 + 2x^2 + 9$$

$$\lim_{x \rightarrow -\infty} f(x) = -\infty$$

$$\lim_{x \rightarrow \infty} f(x) = -\infty$$

Rel Extr. = 6 - 1 = 5

Real zeros = x-int = 6

Cubic/Quartic Regression

$r^2 = R^2 =$ coefficient of determination

Know x.
yr pop.
2006 |
Ctrl-T

Know y

 | 4500

In what year
was the pop.
4500?
Graph + Intersect.

SOLVING POLYNOMIALS

$$(2x^3 - 8x^2 + 3x - 12) = 0$$

$$x^2 - 2x - 3 = 0$$

$$2x^2(x-4) + 3(x-4) = 0$$

$$(x-4)(2x^2+3) = 0$$

$$x-4=0 \quad 2x^2+3=0$$

$$x=4$$

$$\frac{2x^2}{2} = \frac{-3}{2}$$

$$\sqrt{x^2} = \sqrt{\frac{-3}{2}}$$

$$x = \frac{\pm i\sqrt{3} \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}}$$

$$x = \frac{\pm i\sqrt{6}}{2}$$

Solve. $2x^5 + 3x^4 - x^3 + 9x^2 - 55x - 30 = 0$ $\pm 1 \pm 2 \pm 3 \pm 5 \pm 6 \pm 10 \pm 15 \pm 30$

$(2x+5)(x-2)(x \cdot)(x \cdot)(x \cdot)$

$f(1) = 2 + 3 - 1 + 9 - 55 - 30$

$f(2) = 0$

$\frac{\pm 1 \pm 2 \pm 3 \pm 5 \pm 6 \pm 10 \pm 15 \pm 30}{\pm 1 \pm 2}$

$$\begin{array}{r|rrrrrr} 2 & 2 & 3 & -1 & 9 & -55 & -30 \\ & & 4 & 14 & 26 & 70 & 30 \\ \hline & 2 & 7 & 13 & 35 & 15 & 0 \end{array}$$

$(x-2)(2x^4 + 7x^3 + 13x^2 + 35x + 15)$

$$\frac{\pm 1 \pm 3 \pm 5 \pm 15}{\pm 2 \pm 1}$$

$$\begin{array}{r|rrrrr} -3 & 2 & 7 & 13 & 35 & 15 \\ & -6 & -3 & -30 & -15 & \\ \hline & 2 & 1 & 10 & 5 & 0 \end{array}$$

$$(x-2)(x+3)(2x^3 + x^2 + 10x + 5)$$

$$(x-2)(x+3)[x^2(2x+1) + 5(2x+1)]$$

$$(x-2)(x+3)(2x+1)(x^2+5) = 0$$

$$x = 2, -3, -1/2, \sqrt{x^2} = \sqrt{5}$$

$$x = \pm i\sqrt{5}$$