3.1: Polynomials

Def: A poly of degree n ...

examples of polys.

the graphs are smooth - no cusps, corners, breaks, or holes. They are cont on $\mathbb{R}$

Note: polys are alg because they involve only ~~[illegible]~~ + and *. ($-$, $\div$, and $\sqrt{\ }$) would be ok as well.

Note: cubic splines.

end behavior: 4 cases.

examples of end behavior. (compare to leading term).

Real zeros of polys: If P is a poly and $c \in \mathbb{R}$, then the following are equivalent.

(1) c is a zero of P

(2) $x=c$ is a solution to $P(x)=0$

(3) $x-c$ is a factor of $P(x)$.

(4) $x=c$ is an x-int of P.

explain using an example

$\boxed{\begin{array}{c}3,1\\ 2/3\end{array}}$

IVT (as it pertains to the zeros of polys).

If P is a poly & $P(a)$ & $P(b)$ have opposite sign, then $\exists$ at least one $c \in [a,b]$ s.t. $P(c)=0$.

picture proof.

Graphing polys - simple guidlines

(1) zeros, factor

(2) Sign Diagram

(3) y-int.

(4) end behavior

(5) graph

ex: Sketch $P(x) = (3-x)(x+4)(x-1)$

ex: sketch $P(x) = x^3 - 5x^2 + 6x$

ex 4: sketch $P(x) = 9x^2 + 6x^3 + x^4$

The graph near a zero w/ multiplicity m.

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Local extremes.

A poly w/ degree n has @ most n-1 extremes.

ex: look @ end behavior, the roots, & number of extremes for random polys.