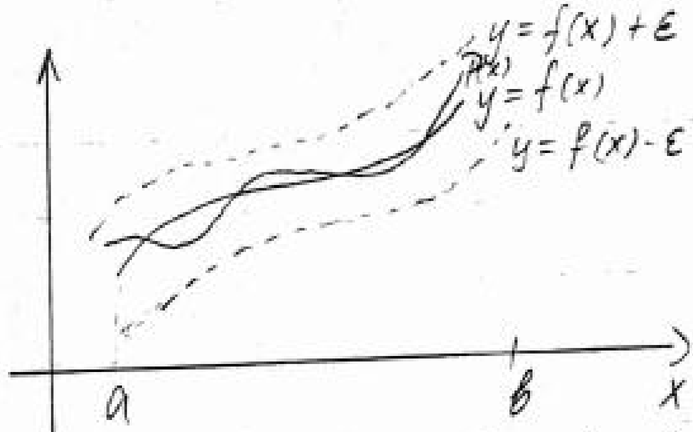
Polynomials are often used since they have a very good property:
Given any function
$f(x)$ - continuous on $[a,b]$
$\varepsilon > 0$ - tolerance
then there is a polynomial $P(x)$ which closer to $f(x)$ then the tolerance

$$|f(x) - P(x)| < \varepsilon \quad \forall x \in [a,b]$$



This fact is guaranteed by

Theorem 3.1 (Weierstrass Approximation Thm)
Suppose that f is defined and continuous on $[a,b]$. For each $\varepsilon > 0$, there exists a polynomial $P(x)$, with the property

$$|f(x) - P(x)| < \varepsilon \quad \forall x \text{ in } [a,b]$$

The most common way to approximate a function near a point is to use Taylor's polynomial.