25 –Mavzu

Differensiyal hisob asosiy teoremalari

1 Aniqmasliklarni ochish Lopital qoidalari

Teorema (Lopital) .Biror a$\in$ x nuqta atrofida f(x),g(x) aniqlanib, hosilalar mavjud bo'lsin. $\lim\limits_{x\to a}$ f(x)=$\lim\limits_{x\to a}$g(x)=0, $g'(x) \neq 0$ .U holda, agar $\lim\limits_{x\to a}\frac{f'(x)}{g'(x)}$ mavjud bo'lsa, $\lim\limits_{x\to a}\frac{f(x)}{g(x)}$ ham mavjud va $\lim\limits_{x\to a}\frac{f(x)}{g(x)} = \lim\limits_{x\to a}\frac{f'(x)}{g'(x)}$

2 Teylor formulasi

Teorema (Teylor Bruk): f(x) funksiya c nuqta va uning atrofida (n+1)- tartibli hosilaga ega bo'lsin. c va x orasida shunday ξ nuqta mavjudki, quyidagi formula o'rinli.

$$f(x)=f(c)+\frac{f'(c)}{1!}(x-c)+\frac{f''(c)}{2!}(x-c)^2+\ldots+\frac{f^{(n)}(c)}{n!}(x-c)^n \; \frac{f^{(n+1)}(\xi)}{(n+1)!}(x-c)^{n+1}$$

Agar Teylor formulasida c=0 bo'lsa Makloren K. formulasi

$$f(x)=f(0)+\frac{f'(0)}{1!}x+\frac{f''(0)}{2!}x^2+\ldots+R_{n+1}(x)\; \frac{f^{n}(0)}{n!}x^n+$$

hosil bo'ladi.

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Makloren formulasi bo'yicha quyidagi yoyilmalarni olish mumkin

1. $e^{x}=1+\frac{x}{1!}+\frac{x^2}{2!}+\frac{x^3}{3!}+\cdots+\frac{x^n}{n!}+0(x^n),$

2. $\sin x=x-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\cdots+(-1)^{n-1}\frac{x^{2n-1}}{(2n-1)!}+0(2^{2n}),$

3. $\cos x=1-\frac{x^2}{2!}+\frac{x^4}{4!}-\frac{x^6}{6!}+\cdots+(-1)^{n}\frac{x^{2n}}{(2n)!}+0(2^{2n+1}),$

4. $(1+x)^m=1+mx+\frac{m(m-1)}{2!}x^2+\cdots+\frac{m(m-1)\ldots(m-n+1)}{n!}x^n+0(x^n),$

5. $\ln(1+x)=x-\frac{x^2}{2}+\frac{x^3}{3}-\cdots+(-1)^{n-1}\frac{x^n}{n}+0(x^n).$

Misollar. 1) f(x)= $\sqrt{x}$ funksiyani x-1 darajalari bo'yicha yoyilmasi uchta hadini toping.

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Teylor formulasi bo'yicha

f(x)=f(1)+ $\frac{f'(1)}{1!}(x-1)+\frac{f''(1)}{2!}(x-1)^2$ $f'(x)=\frac{1}{2\sqrt{x}}, f''(x)=-\frac{1}{4\sqrt{x^3}}$

Demak, $\sqrt{x}=1+\frac{1}{2}(x-1)-\frac{1}{8}(x-1)^2+0((x-1)^2).$