

শত্রুস @ HigherMath 1st Paper 9th Chapter

$$1. \lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$$

$$2. \lim_{x \rightarrow 0} \frac{x}{\sin x} = 1$$

$$3. \lim_{x \rightarrow 0} \frac{\tan x}{x} = 1$$

$$4. \lim_{x \rightarrow 0} \frac{x}{\tan x} = 1$$

$$5. \lim_{x \rightarrow 0} \frac{e^x - 1}{x} = 1$$

$$6. \lim_{x \rightarrow 0} \frac{\ln(1+x)}{x} = 1$$

$$7. \lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$$

$$8. \lim_{x \rightarrow 0} \cos x = 1$$

$$9. \lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}} = e$$

$$10. \lim_{x \rightarrow \infty} (1 + \frac{1}{x})^x = e$$

11. কিছু ধারাs :

$$\bullet e^x = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$$

$$\bullet e^{-x} = 1 - \frac{x}{1!} + \frac{x^2}{2!} - \frac{x^3}{3!} + \dots$$

$$\bullet a^x = 1 + \frac{\ln x}{1!} + \frac{(\ln x)^2}{2!} + \frac{(\ln x)^3}{3!} + \dots$$

$$\bullet a^{-x} = 1 - \frac{\ln x}{1!} + \frac{(\ln x)^2}{2!} - \frac{(\ln x)^3}{3!} + \dots$$

$$\bullet (1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \dots$$

$$\bullet (1-x)^n = 1 - nx + \frac{n(n-1)}{2!}x^2 - \frac{n(n-1)(n-2)}{3!}x^3 + \dots$$

$$\bullet \ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \dots$$

$$\bullet \ln(1-x) = -x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \dots$$

12. বীজগাণিতিক সূত্রs :

$$\lim_{x \rightarrow a} \{f(x) \pm g(x)\} = \lim_{x \rightarrow a} f(x) \pm \lim_{x \rightarrow a} g(x)$$

$$\lim_{x \rightarrow a} c f(x) = c \lim_{x \rightarrow a} f(x)$$

$$\lim_{x \rightarrow a} \{f(x) \cdot g(x)\} = \lim_{x \rightarrow a} f(x) \cdot \lim_{x \rightarrow a} g(x)$$

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{\lim_{x \rightarrow a} f(x)}{\lim_{x \rightarrow a} g(x)}$$

বহুপদীর লিমিট নির্ণয়ের ক্ষেত্রে, সর্বোচ্চ ঘাতের অনুপাত ই যথেষ্ট। (যদি লব ও হরের মাত্রা সমান হয়), লবের মাত্রাবেশি হলে, ∞ । আর হরের মাত্রা বেশি হলে, 0 ।

$$\ln e = 1$$

$$e^{\ln x} = x$$

$$\ln 1 = 0$$

$$\sin x \gg \text{কোণ}$$

$$\sin^{-1} x \gg \text{অনুপাত}$$

$$\frac{d}{dx}(\text{smth}) = \text{অন্তরজ}$$

$$\bullet \frac{d}{dx}(\text{কনস্ট্যান্ট}, c) = 0$$

$$\bullet \frac{d}{dx}(x) = 1$$

$$\bullet \frac{d}{dx}(x^n) = nx^{n-1}$$

$$\bullet \frac{d}{dx}(\sqrt{x}) = \frac{1}{2\sqrt{x}}$$

x^2 বীজগাণিতিক

2^x সূচকীয়

13. সূচকীয় ফাংশনs :

$$\bullet \frac{d}{dx}(a^x) = a^x \ln a$$

$$\bullet \frac{d}{dx}(e^x) = e^x$$

$$\bullet \frac{d}{dx}(\log_a x) = \frac{1}{x} \log_a e$$

$$\bullet \frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\bullet \frac{d}{dx}(\log x) = \frac{1}{x}$$

$$\log_x a = \frac{\ln a}{\ln x}$$

$$\log_{\cos x} \sin x = \frac{\ln \sin x}{\ln \cos x}$$

14. ত্রিকোণমিতিক ফাংশনs :

$$\bullet \frac{d}{dx}(\sin x) = \cos x$$

$$\bullet \frac{d}{dx}(\sec x) = \sec x \cdot \tan x$$

$$\bullet \frac{d}{dx}(\tan x) = \sec^2 x$$

$$\bullet \frac{d}{dx}(\cos x) = -\sin x$$

$$\bullet \frac{d}{dx}(\operatorname{cosec} x) = -\operatorname{cosec} x \cdot \cot x$$

$$\bullet \frac{d}{dx}(\cot x) = -\operatorname{cosec}^2 x$$

15. u, v - যদি x এর ফাংশন হয়, তাহলে $y=uv$ হলে,

$$\frac{dy}{dx} = u \frac{dv}{dx} + v \frac{du}{dx}$$

$$\frac{dy}{dx} = uv \frac{dw}{dx} + vw \frac{du}{dx} + uw \frac{dv}{dx} [y=uvw]$$

16. u, v - যদি x এর ফাংশন হয়, তাহলে $y=\frac{u}{v}$ হলে,

$$\frac{dy}{dx} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

17.

Chain Rule can be anywhere...

18.

All values of angles must be in radian not degree...

19. মূল নিয়মে অন্তরজ নির্ণয় :

$$\frac{d}{dx}[f(x)] = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

20. বিপরীত ত্রিকোণমিতিক ফাংশন এর অন্তরজ নির্ণয় :

$$\bullet \frac{d}{dx}(\sin^{-1}x) = \frac{1}{\sqrt{1-x^2}}$$

$$\bullet \frac{d}{dx}(\tan^{-1}x) = \frac{1}{1+x^2}$$

$$\bullet \frac{d}{dx}(\sec^{-1}x) = \frac{1}{x\sqrt{x^2-1}}$$

$$\bullet \frac{d}{dx}(\cos^{-1}x) = \frac{-1}{\sqrt{1-x^2}}$$

$$\bullet \frac{d}{dx}(\cot^{-1}x) = \frac{-1}{1+x^2}$$

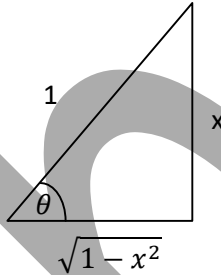
$$\bullet \frac{d}{dx}(\operatorname{cosec}^{-1}x) = \frac{-1}{x\sqrt{x^2-1}}$$

21. $\sin(\sin^{-1}x) = x$ or $\sin^{-1}(\sin x) = x$. একইভাবে, ৬টি ত্রিকোণমিতিক অনুপাতের ক্ষেত্রেও প্রযোজ্য...

22. $\sin^{-1}x = \theta$ এরকম থাকলে, ত্রিভুজ Rule প্রযোজ্য।

$$\downarrow$$

$$\tan^{-1} \frac{x}{\sqrt{1-x^2}}$$



$$23. \sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$$

$$24. \tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}$$

$$25. \sec^{-1}x + \operatorname{cosec}^{-1}x = \frac{\pi}{2}$$

$$26. \tan^{-1}x + \tan^{-1}y = \tan^{-1} \frac{x+y}{1-xy}$$

$$27. \tan^{-1}x - \tan^{-1}y = \tan^{-1} \frac{x-y}{1+xy}$$

$$28. 2 \tan^{-1}x = \tan^{-1} \frac{2x}{1-x^2} = \sin^{-1} \frac{2x}{1+x^2} = \cos^{-1} \frac{1-x^2}{1+x^2}$$

29. বিভিন্ন Format এ x এর প্রতিস্থাপন :

$$\bullet 1+x^2 \gg x = \tan A$$

$$\bullet 1-x^2; \sqrt{1-x^2} \gg x = \sin A$$

$$\bullet x^2-1 \gg x = \sec A$$

$$\bullet 1+x; 1-x; \frac{1+x}{1-x}; \frac{1-x}{1+x} \gg x = \cos A$$

➤ (চলক) চলক হলে, অন্তরজ নির্ণয় এর সময় ln নিতে হয়.

$$\text{➤ L'Hospital } \lim_{x \rightarrow 0} \frac{a}{b} \gg \lim_{x \rightarrow 0} \frac{\frac{da}{dx}}{\frac{db}{dx}}$$