

SISE & CTE, JABALPUR

ONLINE CLASS SESSION

- Date : 11/05/2020
- Coordinator : Shri Pradeep Behre
- Class : B.Ed. 2nd Sem
- Time : 02:00 to 02:40 PM
- Subject : Maths
- Topic : Maths Teaching
- TLM Used : Power Point Presentation
- Attendance : 25 Participant

अकलन पर आधारित अभ्यास प्रश्न

1) x के सापेक्ष अकलन कीजिये
 $x(1+x)^2$ [Ans: $(1+4x+3x^2)$]

2) x के सापेक्ष अकलन कीजिये
 $(\sqrt{x} + \frac{1}{\sqrt{x}})^2$ [Ans: $(1 - \frac{1}{2x})$]

3) यदि $y = x \cdot \sin x$, तो सिद्ध कीजिये
 $\frac{1}{y} \frac{dy}{dx} - \frac{1}{x} = \cot x$

4) यदि $y = \frac{x}{x+5}$, तो सिद्ध कीजिये
 $x \cdot \frac{dy}{dx} = y(1-y)$

5) $y = \sin x, \sec x$ का अकलन गुणों का ज्ञान कीजिये
 [Ans: $\sec x (\tan x + \sec x)$]
 [Hint: $y = \sin x \sec x = (\sin x) \cdot \frac{1}{\cos x} = \tan x \sec x$]

6) $\frac{d}{dx} \sin^3 x = ?$ [Ans: $3 \sin^2 x \cos x$]

7) यदि $y = \log(\sin e^x)$, तो $\frac{dy}{dx}$ ज्ञान कीजिये
 [Ans: $e^x \cdot \cot e^x$]

Ex: Differentiate $(x e^x)$ w.r.t x from first principle

Sol: Let $f(x) = x \cdot e^x$
 hence $f(x+h) = (x+h) \cdot e^{(x+h)}$

$\therefore \frac{d}{dx}(x e^x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ (By definition)

$= \lim_{h \rightarrow 0} \frac{(x+h) \cdot e^{(x+h)} - x \cdot e^x}{h}$ (By placing value)

$= \lim_{h \rightarrow 0} \frac{e^x [(x+h) e^h - x \cdot 1]}{h}$

$= e^x \lim_{h \rightarrow 0} \frac{(x e^h + h e^h - x)}{h}$

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

$= e^x \lim_{h \rightarrow 0} \left[x \frac{(e^h - 1)}{h} + \frac{h e^h}{h} \right]$

$= e^x \left[\lim_{h \rightarrow 0} \frac{x(e^h - 1)}{h} + \lim_{h \rightarrow 0} e^h \right]$

$= e^x \left[\lim_{h \rightarrow 0} \left[x \left(1 + \frac{h}{2} + \frac{h^2}{6} + \dots \right) - 1 \right] + e \right]$

$= e^x \left[\lim_{h \rightarrow 0} \left[x \left(\frac{h}{2} + \frac{h^2}{6} + \dots \right) + 1 \right] + e \right]$

$= e^x \left[\lim_{h \rightarrow 0} x \left(1 + \frac{h}{2} + \frac{h^2}{6} + \dots \right) + 1 \right]$

$= e^x [x + 1]$

or $\frac{d}{dx}(x e^x) = e^x (x+1)$ Ans.

By formula $\frac{d}{dx} x e^x = x \frac{d}{dx} e^x + e^x \frac{d}{dx} x$

$= x \cdot e^x + e^x (1)$

$= e^x (x+1)$ Ans.

Ex: Differentiate $\sqrt{\sin x}$ w.r.t x from first principle

Sol: Let $f(x) = \sqrt{\sin x}$

hence $f(x+h) = \sqrt{\sin(x+h)}$

$\therefore \frac{d}{dx}(\sqrt{\sin x}) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

$= \lim_{h \rightarrow 0} \frac{\sqrt{\sin(x+h)} - \sqrt{\sin x}}{h}$

$= \lim_{h \rightarrow 0} \frac{[\sin(x+h)] - [\sin x] \cdot \sqrt{\sin(x+h)} + \sqrt{\sin x} \cdot [\sin(x+h)] - \sqrt{\sin x} \cdot \sqrt{\sin x}}{h \cdot [\sqrt{\sin(x+h)} + \sqrt{\sin x}]}$

$= \lim_{h \rightarrow 0} \frac{\sin(x+h) - \sin x}{h \cdot [\sqrt{\sin(x+h)} + \sqrt{\sin x}]}$

$= \lim_{h \rightarrow 0} \frac{2 \cos \left(\frac{x+h+x}{2} \right) \sin \left(\frac{h}{2} \right)}{h \cdot [\sqrt{\sin(x+h)} + \sqrt{\sin x}]}$

$= \lim_{h \rightarrow 0} \frac{2 \cos \left(x + \frac{h}{2} \right) \cdot \sin \left(\frac{h}{2} \right)}{h \cdot [\sqrt{\sin(x+h)} + \sqrt{\sin x}]}$

$= \lim_{h \rightarrow 0} \frac{\cos \left(x + \frac{h}{2} \right) \times \frac{\sin(h/2)}{(h/2)}}{[\sqrt{\sin(x+h)} + \sqrt{\sin x}]}$

$= \frac{\cos x}{\sqrt{\sin x} + \sqrt{\sin x}} \times \lim_{h \rightarrow 0} \frac{\sin(h/2)}{(h/2)}$

$= \frac{\cos x}{2 \sqrt{\sin x}} \times 1$ [$\because \lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$]

$= \frac{\cos x}{2 \sqrt{\sin x}}$ (Ans)

or $\frac{d}{dx}(\sqrt{\sin x}) = \frac{\cos x}{2 \sqrt{\sin x}}$

By formula $\frac{d}{dx}(\sqrt{\sin x}) = \frac{1}{2} \frac{d}{dx}(\sin x)^{1/2}$

$= \frac{1}{2} (\sin x)^{-1/2} \cdot \cos x = \frac{\cos x}{2 \sqrt{\sin x}}$ (Ans)

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2:40

97

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