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DPP: 8
Subject: Mathematics
Topic: Limits

Sandwich Theorem

1. $\lim\limits_{n\to\infty}\dfrac{[1^2x]+[2^2x]+[3^2x]+\ldots\ldots+[n^2x]}{n^3}$, where [.] denotes greatest integer function.

2. Evaluate : $\lim\limits_{x\to\infty}\dfrac{x^2+x+1}{[x^2]}=$ ....(where [x] represents greatest integer function)

3. $\lim\limits_{x\to\infty}\dfrac{\log x-[x]}{[x]}$

4. $\lim\limits_{n\to\infty}\dfrac{[x]+[2x]+\ldots+[nx]}{n^2}$

5. $\lim\limits_{x\to 0}\left(\lim\limits_{n\to\infty}\dfrac{[1^2|\sin x|^x]+[2^2|\sin x|^x]+\ldots\ldots+[n^2|\sin x|^x]}{n^3}\right)$,

6. If f(x) is differentiable $\forall x>0$ and $f(x)>0$ which satisfies

$f(x)=\lim\limits_{n\to\infty}\dfrac{[1^2(f(x))^x]+[2^2(f(x))^x]+\ldots\ldots+[n^2(f(x))^x]}{n^3}$, where [.] denotes greatest integer function,

find $f'(x)$.

7. Evaluate $\lim\limits_{n\to\infty}\dfrac{a^n}{n!}$, $a\in R^+$.

8. Solve $\lim\limits_{n\to\infty}x_n$, when $x_n^2=a+x_{n-1}$ and $x_0=\sqrt{a}$.

9. If $a_n=1$ and $a_{n+1}=\dfrac{4+3a_n}{3+2a_n}$, $n\ge 1$ then show $a_{n+2}>a_{n+1}$ and if a_n has a limit l as $n\to\infty$, then evaluate $\lim\limits_{n\to\infty}a_n$.

ANSWER KEY

2. 1 **3.** has value -1 **4.** $\dfrac{x}{2}$ **7.** 0 **9.** $\sqrt{2}$