次の極限値を求めよ。（Ｎｏ．２）

(1) $\lim_{n\to\infty}\left[\log\{(n+1)(n+2)(n+3)\cdots(n+n)\}^{\frac{1}{n}}-\log n\right]$

(2) $\lim_{n\to\infty}\sum_{k=1}^{n}\frac{k}{n^2}\cos\left(\frac{k^2\pi}{2n^2}\right)$

(3) $\lim_{n\to\infty}\int_0^1\sum_{k=0}^{n-1}x^{2n+k}dx$

(4) $\lim_{n\to\infty}\frac{(1+2+3+\cdots+n)^5}{(1+2^4+3^4+\cdots+n^4)^2}$

(5) $\lim_{n\to\infty}\frac{1}{n}\log\left\{\frac{n}{n}\times\frac{n+2}{n}\times\frac{n+4}{n}\times\cdots\times\frac{n+2(n-1)}{n}\right\}$

(6) $\lim_{n\to\infty}\frac{1}{n^6}\sum_{k=n+1}^{2n}k^5$