

Full name :

MAT332 - SERIES AND INTEGRATION
Fall — 2022

First written examination

The unclear answers will be automatically excluded.

Any electronic device is strictly forbidden.

1
2
3

6pt 1. Mark the correct answer :

- (a) $\lim_{n \rightarrow +\infty} (1 + 3/n)^{2n}$ is
 e^6 e^8 $e^6 - 1$ $2e^8$ $2e^8 + 2$ e^7 ;
- (b) $\lim_{n \rightarrow +\infty} \sqrt{n^2 + 2n} - n$ is
 $+\infty$ 0 2 $\sqrt{3/2}$ $\sqrt{2/3}$ 1 ;
- (c) $\lim_{n \rightarrow +\infty} \sqrt[n]{n^3 + 2^n}$ is
 $+\infty$ 0 2 $\sqrt{3/2}$ $\sqrt{2/3}$ 1 ;
- (d) $\lim_{n \rightarrow +\infty} \binom{2n}{n} / n!$ is
 $+\infty$ 0 2 $\sqrt{3/2}$ $\sqrt{2/3}$ 1 ;
- (e) $\lim_{n \rightarrow +\infty} \frac{\sqrt{1+4+\dots+(3n+1)}}{n}$ is
 $+\infty$ 0 2 $\sqrt{3/2}$ $\sqrt{2/3}$ 1 .

8pt 2. Mark the correct answer :

- (a) if $\lim_{n \rightarrow +\infty} n^2 a_n = \frac{1}{2}$, then $\sum_{n=1}^{+\infty} a_n$
 converges diverges;
- (b) $\sum_{n=1}^{+\infty} \frac{2^n n!}{n^n}$
 converges diverges;
- (c) $\sum_{n=1}^{+\infty} \frac{1}{\ln(n) \ln(n)}$
 converges diverges;
- (d) $\sum_{n=2}^{+\infty} \frac{\ln(1+1/n)}{\ln(n) \ln(n+1)}$
 converges diverges;
- (e) $\sum_{n=1}^{+\infty} \ln(1 + e^{-n})$
 converges diverges;
- (f) $\sum_{n=1}^{+\infty} \frac{1}{\ln(n^2+2)}$
 converges diverges;
- (g) $\sum_{n=1}^{+\infty} \frac{\tan^n(\pi/7)}{3^{n+2}}$
 converges diverges;
- (h) $\sum_{n=1}^{+\infty} \frac{\ln(n)}{n^{3/2}}$
 converges diverges.

6pt 3. Mark the correct answer :

- (a) Using that $e = \sum_{n=0}^{+\infty} \frac{1}{n!}$, the series $\sum_{n=2}^{+\infty} \frac{n^3+1}{(n+1)!}$ equals
 $2e$ $2(e-1)$ $2e-1$ $2e-3$ $3e-2$ $2e-4$;
- (b) Using that $\frac{1}{1-q} = \sum_{n=0}^{+\infty} q^n$ for $|q| < 1$, the series $7 \cdot \sum_{n=0}^{+\infty} 8^{-n+1}$ equals
 $+\infty$ 16 18 64 48 32 .