

Department of Mathematics, Bennett University
Engineering Calculus (EMAT101L)
Tutorial Sheet 3

1. Determine which of the following series converges/diverges:

(a) $\sum_{n=1}^{\infty} \frac{4}{n^2 + 3n + 2}$ (b) $\sum_{n=1}^{\infty} \left(\sin^2 \frac{1}{n} - \sin^2 \frac{1}{n+2} \right)$

2. Determine which of the following series converges/diverges:

(a) $\sum_{n=1}^{\infty} 5^{\frac{1}{n}}$ (b) $\sum_{n=1}^{\infty} \left(1 + \frac{x}{n} \right)^n$ (c) $\sum_{n=1}^{\infty} \log \left(\frac{n+1}{n} \right)$ (d) $\sum_{n=1}^{\infty} (a + (n-1)b)$
(e) $\sum_{n=1}^{\infty} a_n x^n$, where $0 \leq a_n \leq 1$ ($n \geq 0$) and if $0 \leq x < 1$.

3. Determine which of the following series converges/diverges:

(a) $\sum_{n=1}^{\infty} \frac{\log n}{n^{3/2}}$ (b) $\sum_{n=1}^{\infty} \frac{1}{n \sqrt[n]{n}}$ (c) $\sum_{n=1}^{\infty} \frac{\sqrt[n]{n}}{n^2}$ (d) $\sum_{n=0}^{\infty} \sin \left(\frac{\pi}{2^n} \right)$ (e) $\sum_{n=1}^{\infty} \frac{1}{n} \sin \left(\frac{1}{\sqrt{n}} \right)$

4. Determine which of the following series converges/diverges:

(a) $\sum_{n=1}^{\infty} \frac{n^{\sqrt{2}}}{2^n}$ (b) $\sum_{n=1}^{\infty} \frac{n!}{10^n}$ (c) $\sum_{n=1}^{\infty} \frac{n!}{(2n+1)!}$

5. Determine which of the following series converges absolutely/conditionally:

(a) $\sum_{n=1}^{\infty} (-1)^n \frac{1}{n}$ (b) $\sum_{n=1}^{\infty} (-1)^n \frac{\sin nx}{n^2}$ (c) $\sum_{n=2}^{\infty} (-1)^n \frac{1}{\log n}$

6. Find the value of x for which the following series converges:

(a) $\sum_{n=0}^{\infty} (n+1+2^n)x^n$ (b) $\sum_{n=0}^{\infty} \frac{n!x^n}{n^n}$ (c) $\sum_{n=1}^{\infty} \frac{n^{n^2}}{(n+1)^{n^2}}(x-1)^n$