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

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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:

   $(a)\ \sum_{n=1}^{\infty}5^{\frac{1}{n}}$ $(b)\ \sum_{n=1}^{\infty}\left(1+\frac{x}{n}\right)^n$ $(c)\ \sum_{n=1}^{\infty}\log\left(\frac{n+1}{n}\right)$ $(d)\ \sum_{n=1}^{\infty}(a+(n-1)b)$

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

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

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:

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