Course Name:	**Engineering Calculus**	Course Code:	**EMAT101L**
Academic Year:	2024-25	Semester:	Odd
Date:	August 24, 2024	Type:	3-1-0
Tutorial Sheet:	**2**		

CO-mapping:

	CO1	CO2	CO3	CO4	CO5	CO6
Q1	✓					
Q2	✓					
Q3	✓					
Q4	✓					
Q5	✓					

Objectives: Students will be able to understand and apply the different methods of convergence and divergence of a sequence.

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1. Show that the sequence $< S_n >$, defined by the recursion formula

$$S_{n+1} = \sqrt{3S_n} \qquad S_1 = 1$$

converges to 3.

2. Examine if the following sequences converge, diverge or oscillate. The n^{th} term of the sequence are given by:

   (a) $a_n = n.(-1)^{n+3}$

   (b) $a_n = \dfrac{n^3}{n+1}$

   (c) $a_n = \dfrac{\cos^2 n}{n}$

3. Show that the following sequences, whose n^{th} terms are given below, are the convergent sequences.

   (a) $a_n = \left(1 + \dfrac{1}{n}\right)^n$

(b) For any real number x, $a_n = \dfrac{x^n}{n!}$

(c) $a_n = \left(\dfrac{1}{\sqrt{n^2+1}} + \dfrac{1}{\sqrt{n^2+2}} + \dfrac{1}{\sqrt{n^2+3}} + \cdots + \dfrac{1}{\sqrt{n^2+n}}\right)$

4. Use Sandwich theorem to prove that

(a) $\displaystyle\lim_{n\to\infty} \frac{1}{n}\sin^2 n = 0.$

(b) $\displaystyle\lim_{n\to\infty} \left[\frac{n}{n^3+1} + \frac{2n}{n^3+2} + \cdots + \frac{n^2}{n^3+n}\right] = \frac{1}{2}.$

5. Use Monotone convergence theorem to prove that

$$\{x_n\} = \left\{\frac{1}{n+1} + \frac{1}{n+2} + \cdots + \frac{1}{n+n}\right\}$$

is convergent.

"Constantly think about how you could be doing things better. Keep questioning yourself." —— Elon Musk