



**PU Maths Club**  
For Sharing Mathematical Knowledge

**Department of Mathematics,  
Panjab University, Chandigarh**



invites you to a talk on

# **Applications of Newton Polygons to Irreducibility of Polynomials**

by

**Dr. Ankita Jindal, Postdoc., ISI Bangalore**

As per the following schedule

**2-3 pm, Wednesday**

**February 15, 2023**

**at Seminar Room, Dept. of Mathematics**

**Abstract:** Let  $\alpha$  and  $n$  be integers with  $n \geq 1$ . We shall discuss the problem of irreducibility of Generalised Laguerre Polynomials  $L_n^{(\alpha)}(x)$  with degree  $n$  and parameter  $\alpha$  defined by

$$L_n^{(\alpha)}(x) = \sum_{j=0}^n (-1)^{n-j} \frac{(n+\alpha)(n-1+\alpha)\cdots(j+1+\alpha)}{(n-j)!j!} x^j.$$

When  $\alpha = -n - 1$ ,  $L_n^{(-n-1)}(x) = \sum_{j=0}^n \frac{x^j}{j!}$  is the  $n^{\text{th}}$  Taylor polynomial

of the exponential function. In 1930, I. Schur proved that  $L_n^{(-n-1)}(x)$  is irreducible over the field  $\mathbb{Q}$  of rational numbers and its Galois group over  $\mathbb{Q}$  is the alternating group  $A_n$  or symmetric group  $S_n$  of degree  $n$  according as  $n \equiv 0 \pmod{4}$  or not. We describe classes of the

polynomials  $L_n^{(\alpha)}(x)$  when these polynomials are irreducible over  $\mathbb{Q}$ . The irreducibility is established using Newton polygons which will also be defined in the talk and their main properties will be mentioned. This talk is partly based on joint work with Shanta Laishram, Saranya Nair, Ritumoni Sarma and Tarlok Nath Shorey.