VIII. Calculating limits:

i) *Plug-in* limits:

- We don’t have problems in plugging the number into the limit (applying the value directly to the limit).

*Examples:*

@ \( \lim_{x \to 4} (4x^2 + 5x + 1) = 10 \)

@ \( \lim_{x \to 2} 4x - 3 = \frac{5}{2} \)

\( 2x - 1 \quad 3 \)

*Mathematical inconsistencies.*

ii) *Factoring* limits:

- We have problems (mathematical inconsistencies) in just applying the value directly to the limit.

*Examples:*

@ \( \lim_{x \to 1} x - 1 = \lim_{x \to 1} x^2 - 2x + 1 = 2 \)

@ \( \lim_{x \to 2} x^2 - 3x + 2 = \lim_{x \to 2} (x - 2)(x - 1) = 1 \)

\( x - 2 \quad x - 2 \)

*Factoring techniques:*

- \( a^2 - b^2 = (a+b)(a-b) \)

- \( a^2 + 2ab + b^2 = (a+b)^2 = (a+b)(a+b) \) or \( (a-b)(a-b) \)

- \( a^3 + b^3 = (a+b)(a^2 - ab + b^2) \)

- Extracting roots from polynomials: \( a(x-x_1)(x-x_2)(x-x_3) \)