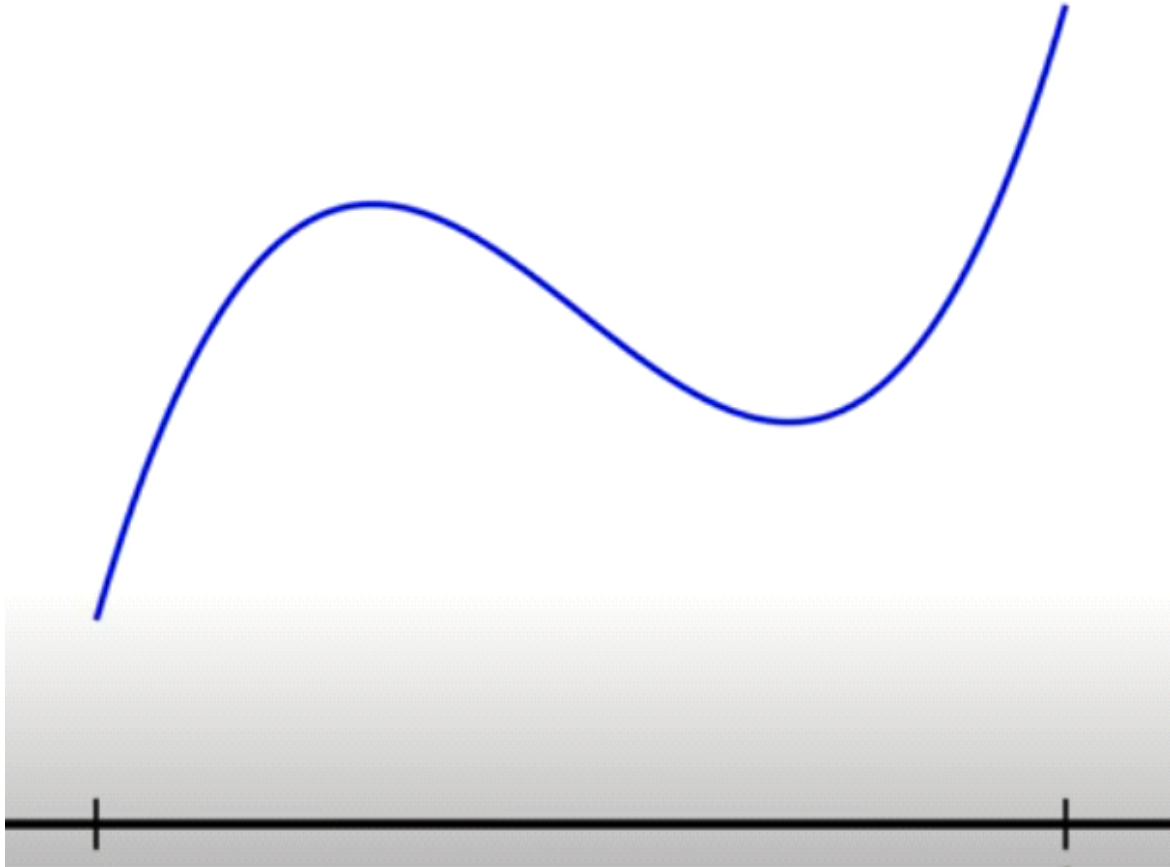# Absolute Maximum & Minimum

Tuesday, 20 August 2024      2:01 pm

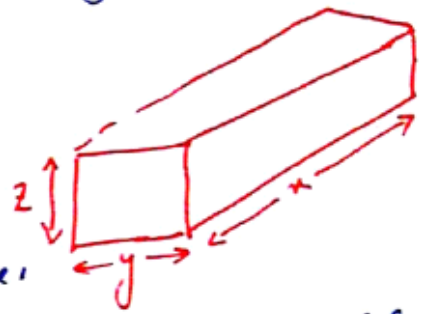## ABSOLUTE MINIMUM & MAXIMUM VALUES:

### (EXTREME VALUE THEOREM)

**EXAMPLE:** A rectangular box without a lid is to be made from $12m^2$ of cardboard. Find the maximum volume of such box.

**Sol:** Since volume of a rectangular box is

$$V = xyz$$

The relation of volume can be expressed in 2 variables if we note that the area of 4 sides and the bottom of the box is

$$2xz + 2yz + xy = 12$$

1- Find the values of 'f' at the Critical Points of 'f' in 'D'.

2- Find the extreme values on the boundary of 'D'.

3. The Largest values of the values obtained in step 1 & 2 is absolute Maximum value, and the smallest is the absolute Minimum value.

EXAMPLE: Find The Absolute Minimum & Maximum values
of the function
$$f(x,y) = x^2 - 2xy + 2y \quad \text{on} \quad \text{The rectangle } D;$$
$$D = \{ (x,y) \mid 0 \le x \le 3, \, 0 \le y \le 2 \}$$

Sol:

Q - $f(x,y) = x^2 + y^2 - 2x$ ; D is a triangular region defined by $(2,0), (0,2)$ & $(0,-2)$

Q - $f(x,y) = x + y - xy$ ; where D is a triangular region defined by $(0,0), (0,2)$, & $(4,0)$

$f(4,2) = f(0,0) \quad - \ \upsilon$

**Q** Find the absolute extrema of $f(x,y) = 5 + 4x - 2x^2 + 3y - y^2$
on the region '$D$' bounded by the lines
$$y = 2 \; ; \; y = x \; ; \; y = -x .$$

**Sol:**