CURVE & REPRESENTATION

WHAT IS CURVE :- There are lots of definitions for Curve but we will focus on 2 main definitions for our understanding.

DEF 1 :- When sets of points infinite or finite are joined continous then what we get is called Curve.

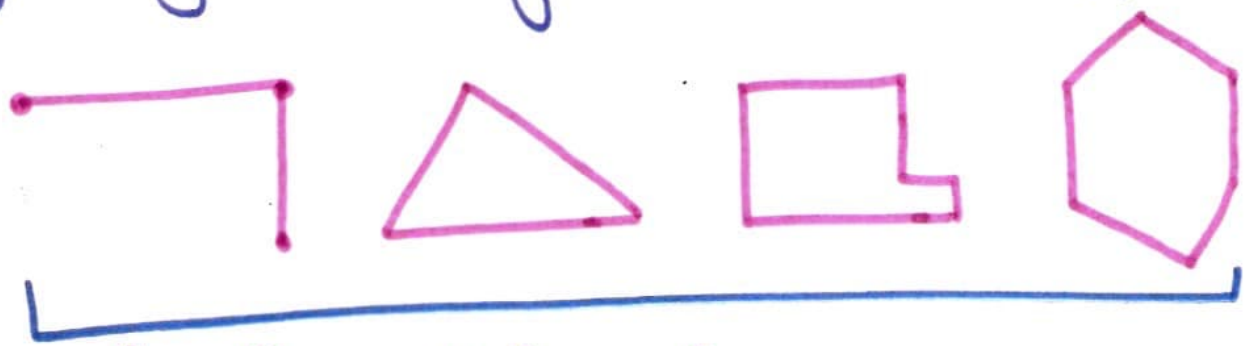
DEF 2- When we start from a point for drawing a geometrical figure and end at some other point without any GAP, so what we get is called **CURVE.**

One Question comes in mind that as per definition is LINE ALSO A CURVE?

Curve ?

YES, Mathematically a line is also Curve.

If LINE is a Curve then all the geometrical figures generated by Line also a Curve?



Are they all Curve?

As the Mathematics Says all the above figures are Curve.

But we focus here on other definition as well which says

In Mathematics, a Curve is generally speaking, an object similar to a line but that need not to be Straight, Thus, a Curve is generalization of a line, in that it may be Curved (bend, Smoothness).

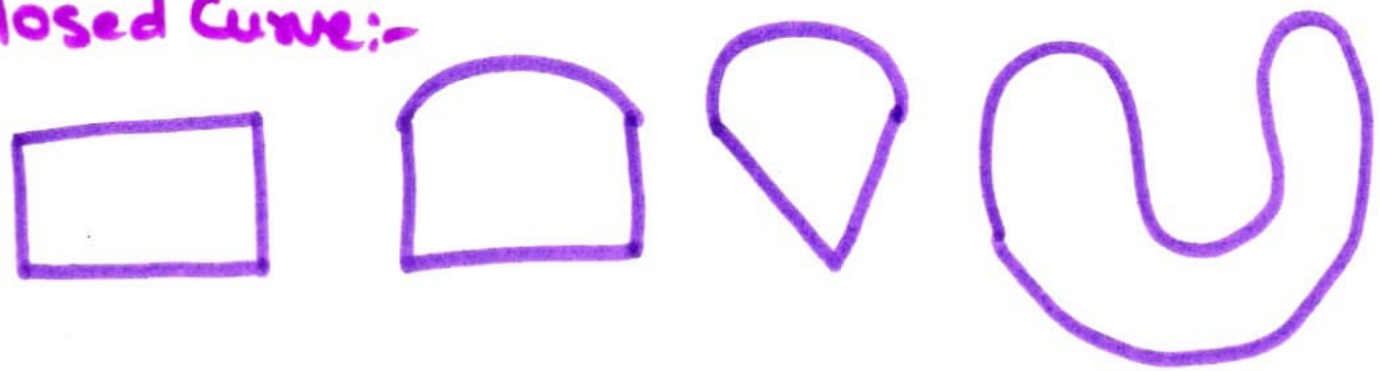
This Circle is Curve

but this is Not as there is GAP.

There are many types of curves like:-

Open Curve:-

Closed Curve:-



Crossing Curve:-

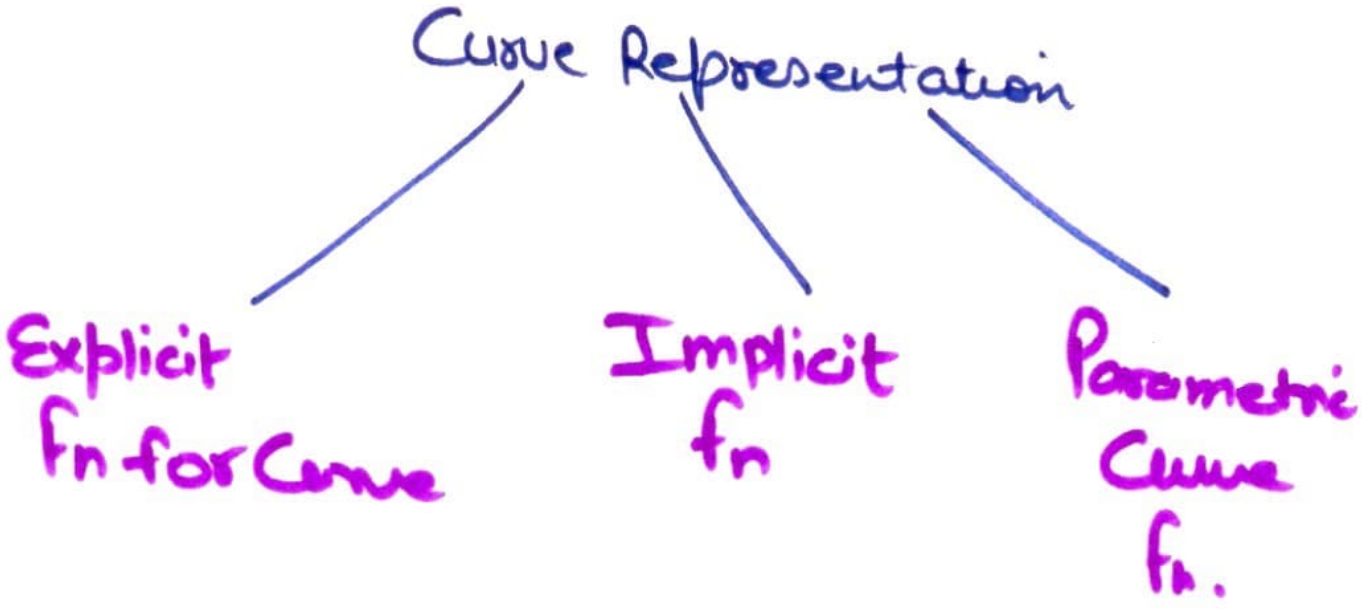
REPRESENTING CURVES :-

In Computer Graphics we daily need to draw or design different types of objects which are not flat but have bends and deviations and most importantly Smoothness.

Like Human face, Automobiles designs and many more.

So Computer need to Calculate or Compute all Curves so they can provide the Smoothness in Curve.

We Can represent basically Curves by 3 mathematical function



Explicit Representation of Curves:-

→ In this the dependent variable has been given "Explicitly" in terms of the independent variable. denoted as

$y = f(x)$ Example:- $y = ax^n + bx \ldots$

$y = 5x^3 + 2x + 1$

or $5x^2 + x$

Like a line $y = mx + c$

→ Explicit representation is single valued for each value of x only a single value of y is computed.

Implicit Representation of Curves:-

In this dependent variable is not expressed in terms of some independent variables.

$f(x, y) = 0$ $x^2 + y^2 - 1 = 0$

$y^4 + x^3 + 18 = 0$

It can represent multivalued curves (Multiple y values for an x value) $x^2 + y^2 - R^2 = 0$ Circle.

Although you can Convert a implicit f^n into Explicit f^n but generally it should not be done. blc.

The new explicit Function becomes very complex and Some times also gives two different Function branch.

for example :- If we Convert implicit Curve $x^2+y^2-1=0$ to explicit Curve it will give us $y = \pm\sqrt{1-x^2}$

Now new explicit f^n become very Complex and Some times it gives us 2 branches.

here y has 2 branch One is +ve & Second is -ve.

PARAMETRIC CURVES :-

→ Most of the Curve representation's follow the parametric form.

→ Curves having parametric form are called parametric Curves.

→ There are many Curves which we cannot write down as a Single equation in terms of only x and y.

→ Instead of defining y in terms of x ($y = f(x)$) or x in terms of y ($x = h(y)$) we defining both x and y in terms of a third variable called a Parameter

$$x = f_x(u) \quad u \text{ is parameter.}$$

$$y = f_y(u)$$

Like line Parametric equation is

$$x = (1-u)x_0 + ux_1$$

$$y = (1-u)y_0 + uy_1$$