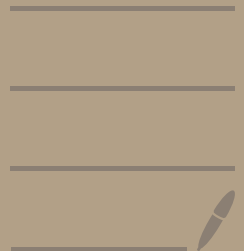L21 — 22/10/2024

Greek geo. is attributed to Thales &
was devp. by Euclid in his Elements

Euclid's postulates

1. Two distint pts. determine a (unique) straight line.

2. A line segment can be infinitely extended to a (unique) line.

3. Given any radius & a pt., there is a (unique) circle with pt. as center & radius as the given one.

4. All right angles are equal to each other.

5. Suppose a line intersects two other lines s.t the sum of interior angles α & β ($\leq \pi/2$) with the

α β

P
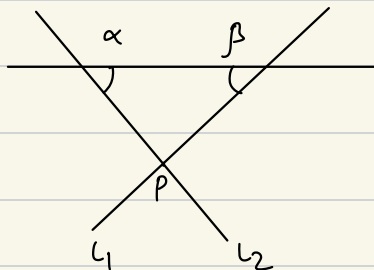
L_1 L_2

two lines is $\alpha + \beta < \pi$

Then, l_1 & l_2 can be extended to intersect at a pt. P.

Note, the notions of a line & circle are _not_ defined & relies on intuition.

Limitations of Euclid's Elements

— Euclid does _not_ (as per the text), stick only to the axioms, but also some other statements are taken as self-evident.

— This axiom based approach is awkward to deal with for higher degree curves like cubics.

The questions related to foundations of axioms were dealt by Hilbert.

The question of whether 5th postulate was indep. of the first 4 was open for hundreds of years
Now, it is known to be indep., giving rise to non-Euclidean geometry.

So, Euclidean geometry has largely been replaced by Coordinate geometry.