Torsion :- The differentiation of $\bar{b}$ w.r.t 's' is called ③ torsion vector whose magnitude is denoted by τ

i.e $\tau = \left|\frac{db}{ds}\right|$

The reciprocal of torsion is called radius of torsion it is denoted by σ

i.e $\sigma = \frac{1}{\tau}$

or $\boxed{\sigma\tau = 1}$

Skew curvature :- The differentiation of n w.r.t 's' is called skew curvature whose magnitude is denoted by $\sqrt{K^2 + \tau^2}$

Theorem :- A necessary and sufficient condition for a curve to be a straight line is that the curvature $K = 0$ at all points of curve.

Proof :- Necessary condition :- Let curve is straight line then show $K = 0$

The eqn of straight line in vector form

$r = as + b$ ——— ①

where a = slope and
b = Constant

differentiate ① w.r.t 's' we get

$r' = a$

but $\frac{dr}{ds} = t$

$\Rightarrow t = a$

differentiate w.r.t 's' we get

$\frac{dt}{ds} = 0$

taking mode on both side

$\left|\frac{dt}{ds}\right| = 0 \Rightarrow \boxed{K = 0}$

Sufficient condition :- Let $K = 0$ then show curve is the straight line