(E) Given Transfer function,

$$TF = \frac{K}{(s^2+2s+5)}$$

Now This Equation does not have zeroes but it has complex poles,

$P=2;\ Z=0$

The complex poles are roots of s^2+2s+5,

ie, $s^2+2s+5=0 \Rightarrow (s+1)^2=-4 \Rightarrow (s+1)=\pm 2i$

$\Rightarrow s=-1+2i$ (or) $s=-1-2i$

Let us locate the poles and first let us find asymptote angle and centroid.

$$\text{Centroid} = \frac{-1+2i+(-1-2i)}{2-0} = \frac{-2}{2} = \underline{-1}$$

Angle made by Asymptots $= \frac{(2q+1)\pi}{2}$ = only two possible value of angle

$= (\pi/2)$ and $(3\pi/2)$

$= \frac{180^\circ}{2}$ 90° and 270

hence, Asymptote is against -ve real axis.

as both the poles are complex we can calculate Angle of departure,

Angle of departure $(\beta) = 180^\circ -$ (angle made relative to other poles) + (angle made relative to other zeroes)

$= 180^\circ - 90^\circ = 90^\circ \rightarrow$ angle of departure

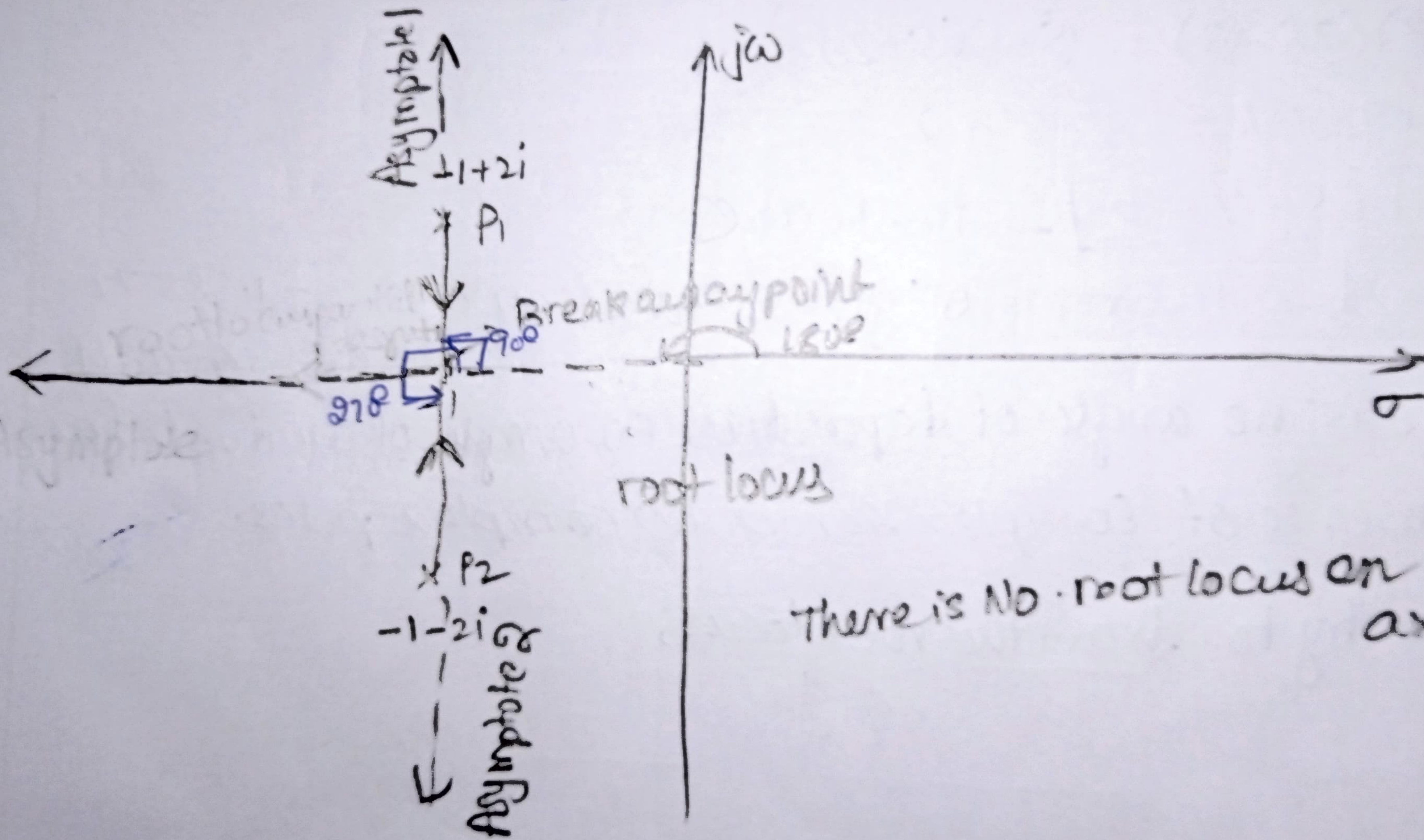
Which is 270° for other pole,

and if we use characteristic Equation, which is,

$$\frac{K}{s^2+2s+5} = -1 \Rightarrow K = -(s^2+2s+5)$$

$$\frac{dK}{ds} = 0 \Rightarrow -(2s+2)=0 \Rightarrow \boxed{s=-1}$$

And hence Break away point is same as centroid, ie,
if we draw root locus,



There is No root locus on real axis at all