(F) Transfer function is given as $\left(\frac{K \cdot S}{S^2+2S+5}\right)$

In this Transfer function, poles are $-1+2i$ and $-1-2i$ and the zero of the Transfer function is $S=0$

$\Rightarrow$ $\boxed{P=2}$ and $\boxed{Z=1}$

Centroid of Asymptotes $= \frac{(-1+2i-1-2i)-(0)}{2-1}$ → centroid

$= \frac{-2}{1} = \boxed{-2}$ //

Angle of Asymptotes $= \left(\frac{(2q+1)}{2-1}\right) \times 180^\circ = \left(\frac{2q+1}{1}\right) 180^\circ$

$q=0$ → 180° only one asymptote

Now, let us find,

Breakaway points

(a) Break in point

s^2+2s+5

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

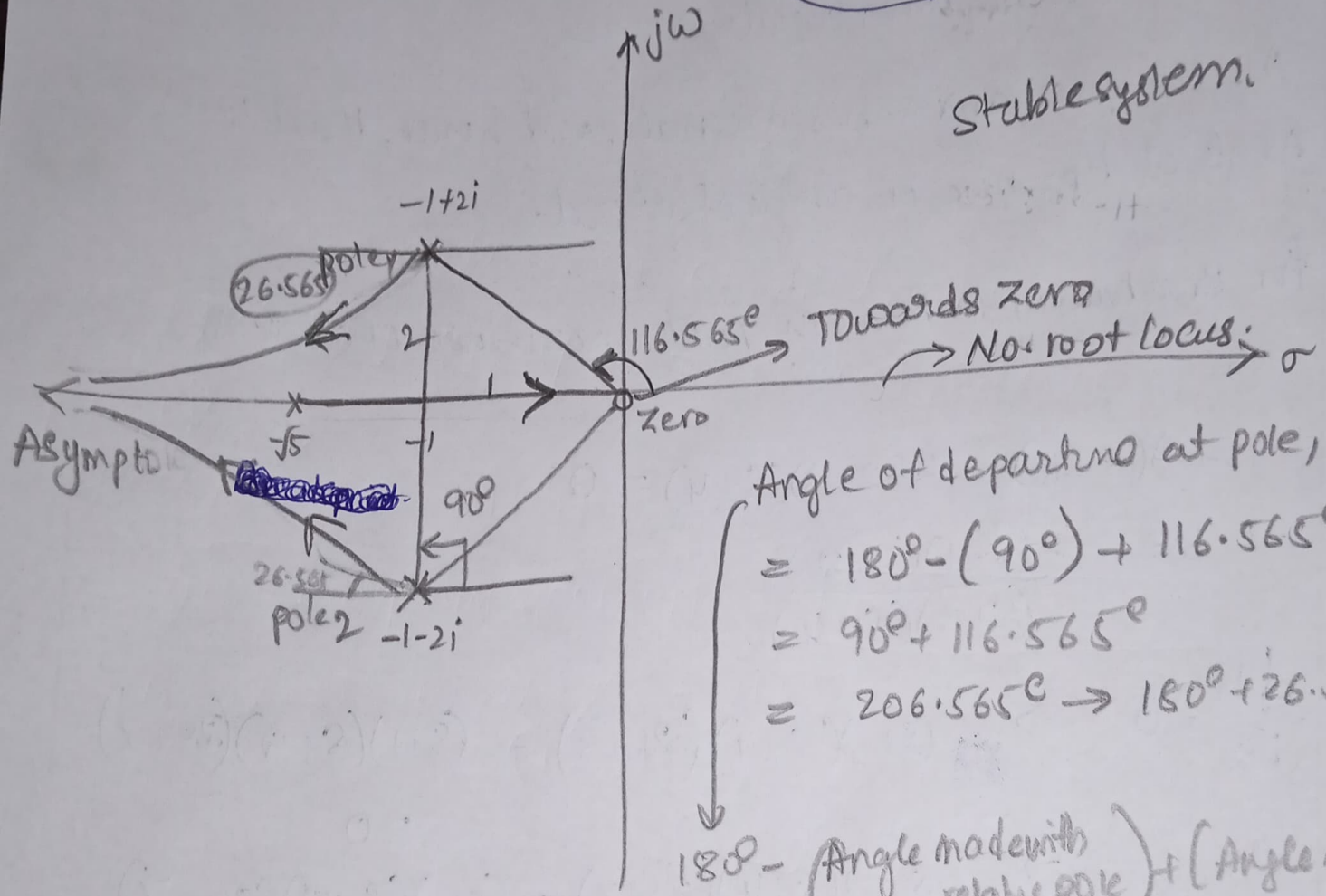
$\frac{dK}{ds} = +1 - \frac{5}{s^2} = 0 \Rightarrow 1 = \frac{5}{s^2} \Rightarrow s^2 = 5$

$\Rightarrow s = \pm\sqrt{5}$

$\Rightarrow s = \pm 2.236067$

There cannot be a Break point in positive side,

let us try to draw the root locus, $s = -\sqrt{5}$



Stable system.

Angle of departure at pole,

$= 180° - (90°) + 116.565°$

$= 90° + 116.565°$

$= 206.565° \rightarrow 180° + 26.56°$

$180° - (\text{Angle made with relative pole}) + (\text{Angle by Zero})$

Asymptote is along -ve real axis

from $-\sqrt{5}$ to origin (zero) and two branches from pole