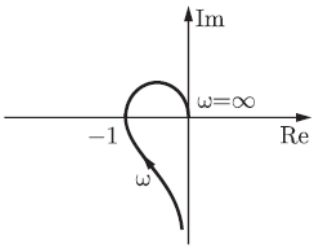
Type 8: Nyquist Stability Criterion

For Concept, refer to Control Systems K-Notes, Frequency Response Analysis

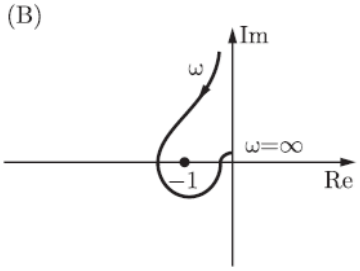
Common Mistake:
N = P – Z, we often confuse between the terms P and Z so try to remember them clearly.

Sample Problem 8:
Consider the following Nyquist plots of loop transfer functions over ω = 0 to ω = 3. Which of these plots represent a stable closed loop system?

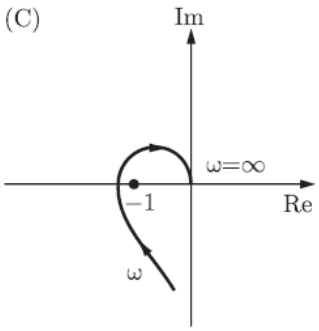
(A)



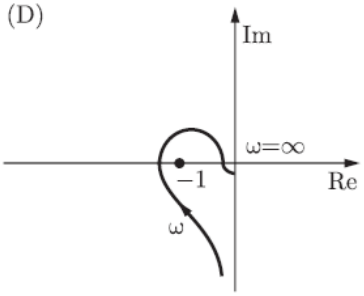
(B)



(C)



(D)



(A) (a) only (B) all, except (a) (C) all, except (c) (D) (a) and (b) only

Solution: (A) is correct option
In the given options only in option (a) the nyquist plot does not enclose the unit circle (− 1, j0), So this is stable.

Unsolved Problems:

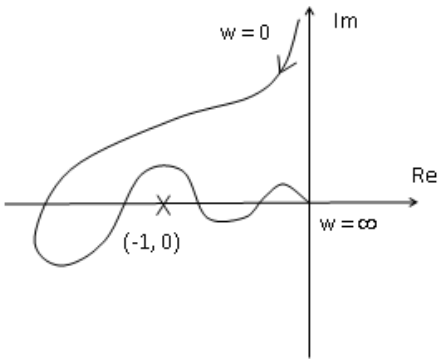
Q.1 The nyquist plot of a closed loop system is shown in the given figure. The plot indicates that the

(A) System is unstable

(B) System is stable

(C) System is critically stable

(D) Stability of the system can't be determined



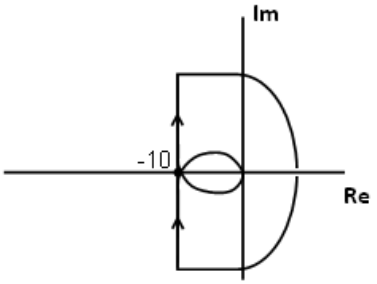
Q.2 The Nyquist plot of G(s) H(s) which is given below. The corresponding closed loop system is unstable with two right hand poles. The number of open loop right hand poles are?

(A) 1

(B) 2

(C) 3

(D) 0



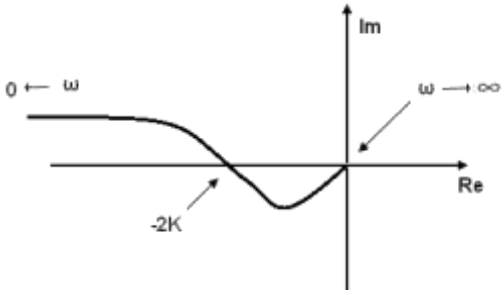
Q.3 Suppose the Nyquist plot of the loop transfer function G(jω)H(jω) for ω=0 and ω=∞ for a single loop feedback control system is shown in the figure . The gain K appears as a multiplying factor in G(s)H(s). One pole of G(s)H(s) lies in the right half of the s-plane and no pole is on the jω axis .Which of the following statements is true in the case of closed loop stability

(A) The closed loop system is stable for 0.25<K<0.5

(B) The closed loop system is stable for K>0.5

(C) The closed loop system is unstable for all values of K

(D) The closed loop system is stable for K=0.25



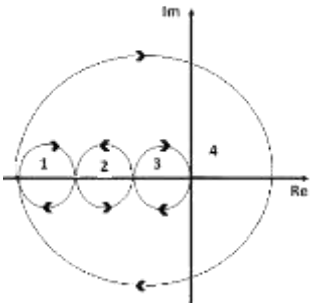
Q.4 The Nyquist plot of G(s)H(s) which has no RHP on given below, the corresponding closed loop to be stable (-1, j0) should lie in the region

(A)1

(B)2

(C)3

(D)4



Q.5 The Nyquist plot shown in the figure below, what is the type of the system?

(A)1

(B)2

(C)3

(D)4