**Fractional Pole**

Fractional zero transfer function is given by ) = …... (4)

Put s = jω, in equation (4) results into ) = …… (5)

Magnitude in dB is given by |) | dB = -20log ( )

**Calculation procedure**

==

Applying De Moivre’s theorem in above equation we get

= …… (6)

Put equation (6) in (5) we get

) = =

Magnitude, |) | =

= =

Now, Magnitude in dB, |) | dB = -20log

In the sum ), dominates at lower frequencies whereas dominates at higher frequencies.

For approximation we consider = .We obtain corner frequency, =.

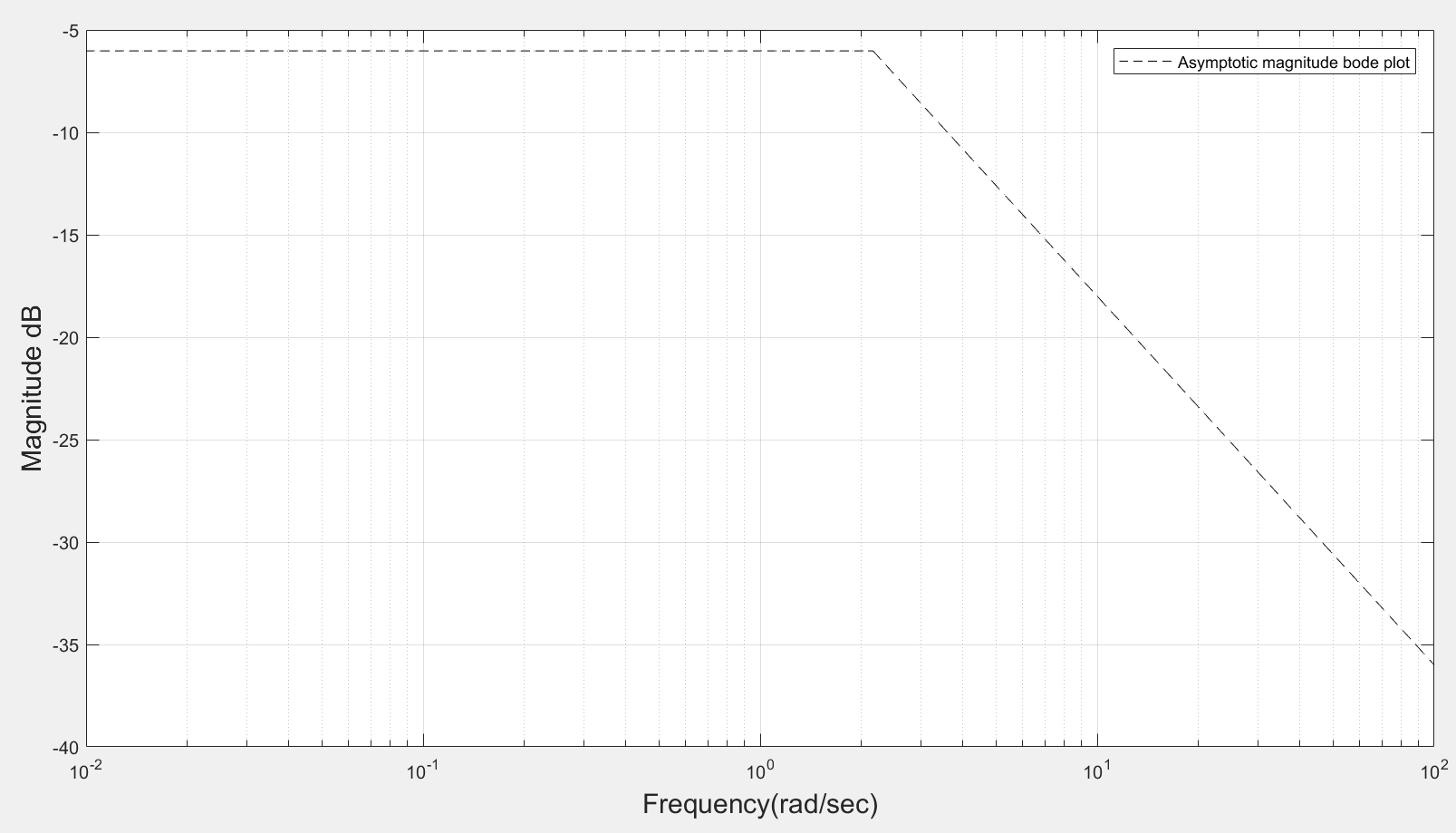
Now, following approximation of magnitude is obtained:

1. For ω ≤ , |T(jω) | dB = -20log = -20log|a|.
2. For ω >, |T(jω) | dB = -20log= -20αlog ω.

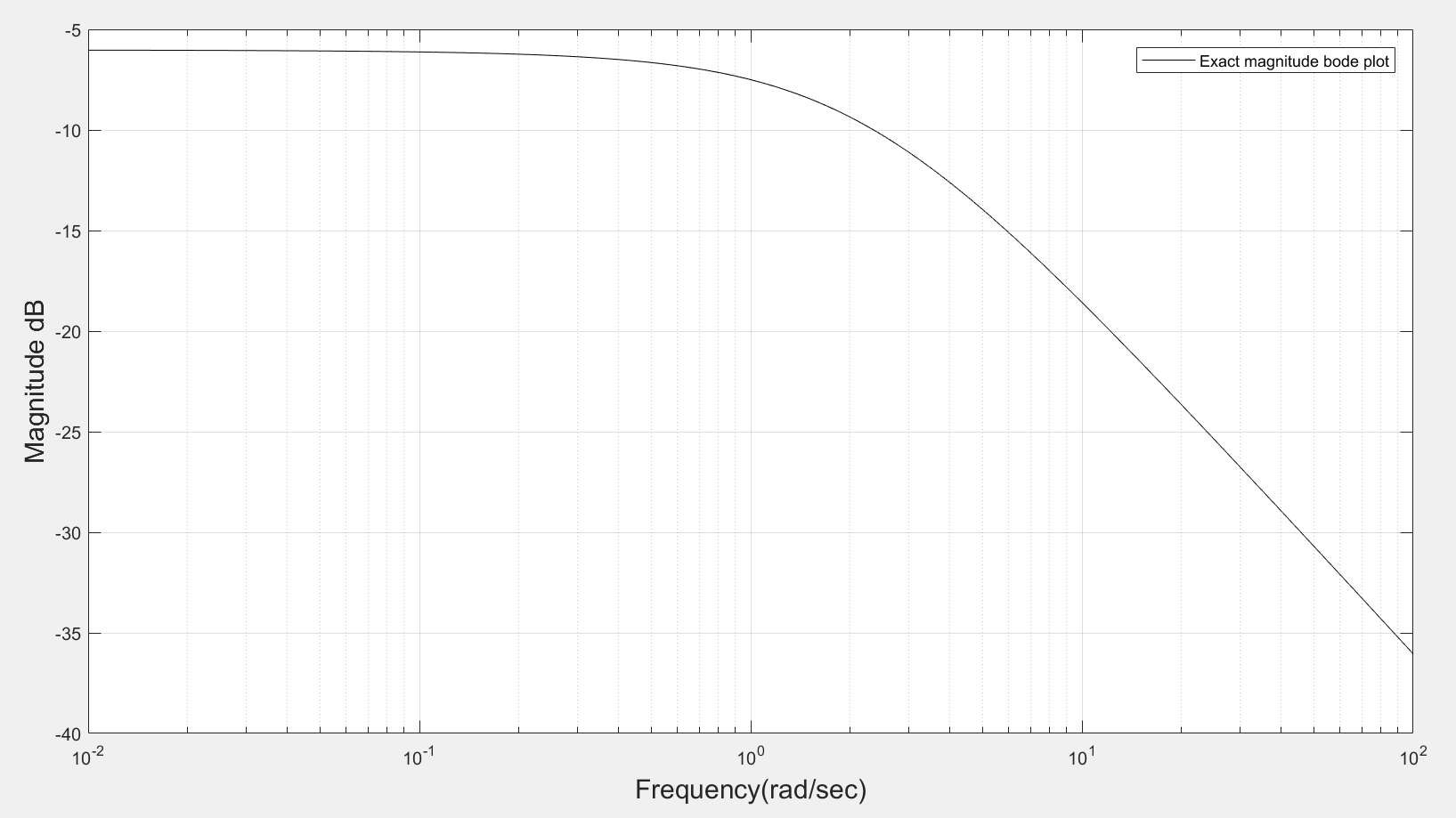
**Procedure**

* Compute the corner frequency = and locate point A at magnitude -20log|a|.
* Draw a slope 0 dB/decade for ω ≤ and a line with slope -20α dB/decade for ω>

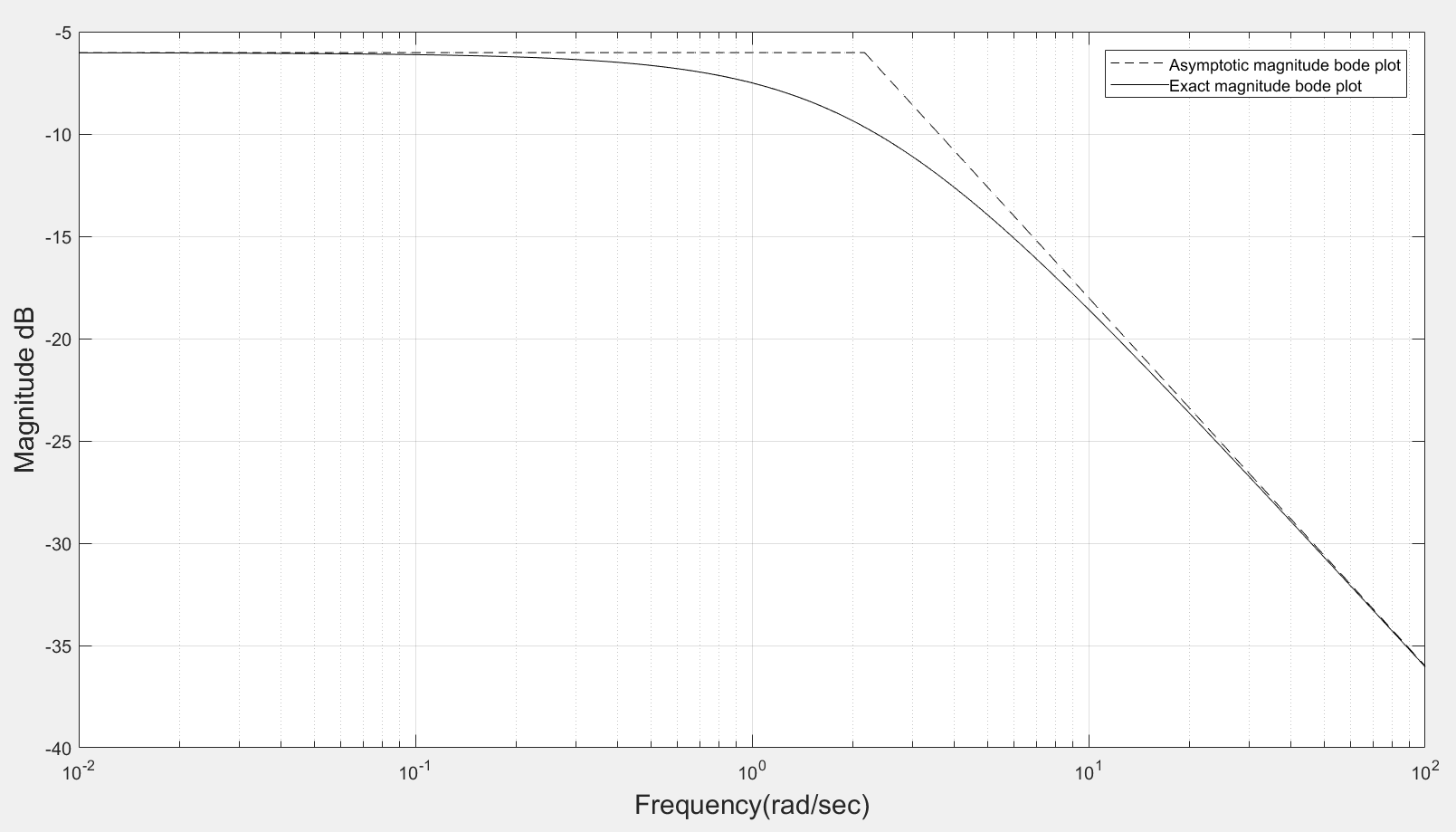
**Result:** Taking α = 0.9, a=2 and = 2.1584.



**Figure 3.5- Asymptotic magnitude bode plot of fractional pole.**



**Figure 3.6-Exact magnitude bode plot for fractional pole.**

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**Figure 3.7-Real and asymptotic bode plot for fractional pole.**