TOOL: The graph below shows the Bode plot lines for example transfer function, $H(s)$, with real zero and poles.

$$H(s) = \frac{8s\left(\dfrac{s}{100}+1\right)}{\left(\dfrac{s}{10}+1\right)\left(\dfrac{s}{2\text{k}}+1\right)}$$

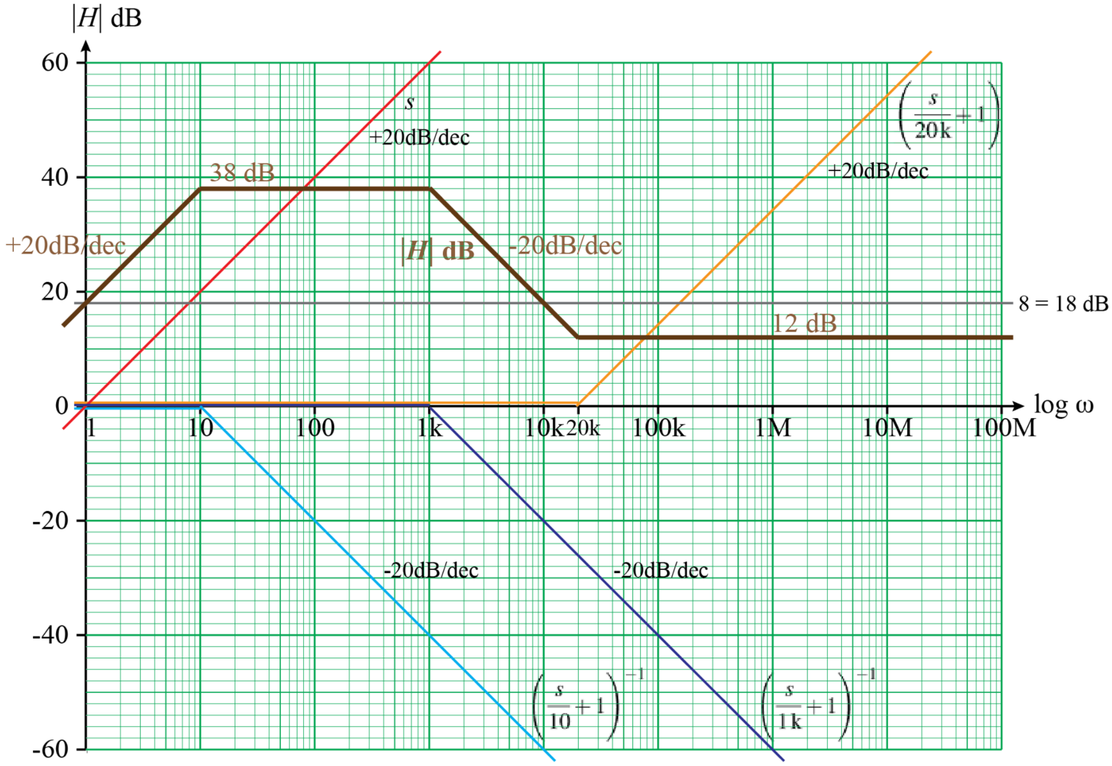

Fig. 1. Bode magnitude plot of $H(s)$.

Rules:

1) The multiplier, 8, is constant with frequency so is a horizontal line across the graph at 18 dB.

2) A zero at the origin, s, gives a line through the Bode "origin" at (1 r/s, 0 dB). The line's slope is +20 dB/dec on both sides of the origin.

3) A zero at ω_0 gives an "elbow" curve that is 0 dB up to ω_0 and slopes up from ω_0 at a slope of +20 dB/dec.

4) Pole terms in denominator yield upside-down versions of the zero curves.

Fig. 2 shows the approximate and the actual curve for a single zero starts out at 0 dB, gently curves up to a value of 3 dB at $\omega = \omega_0$, and then approaches a line that slants upward with a slope of +20 dB per decade (i.e., factor of ten) change in frequency.

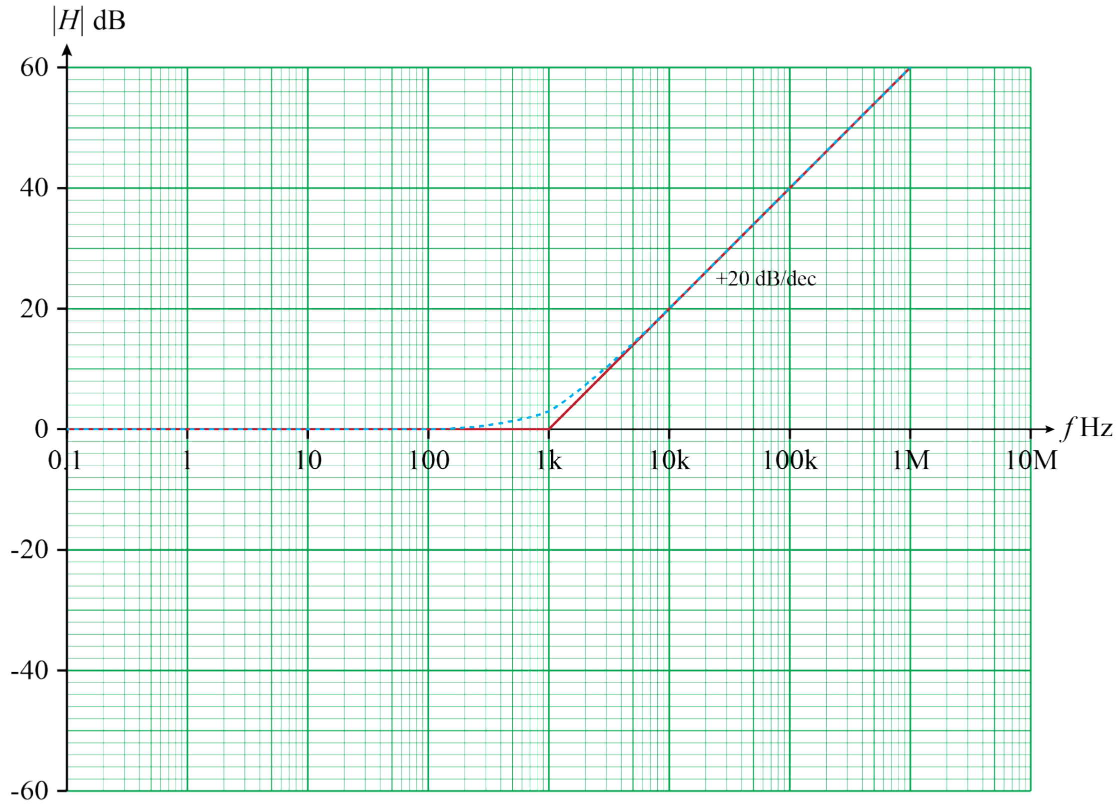

Fig. 2. Bode plot of single real zero (solid lines), and actual curve (dotted line).

TABLE I

Decibel (or dB) approximate values

value	dB = $20\log_{10}$(value)	approx dB
1	0.00	0
$\sqrt{2}$	3.01	3
2	6.02	6
3	9.54	9.5
4	12.04	12
5	13.98	14
6	15.56	15.5
2π	15.96	16

Shift plot left by $\log_{10}(2\pi) = 0.798 \doteq 0.8$ of a decade for Hz.