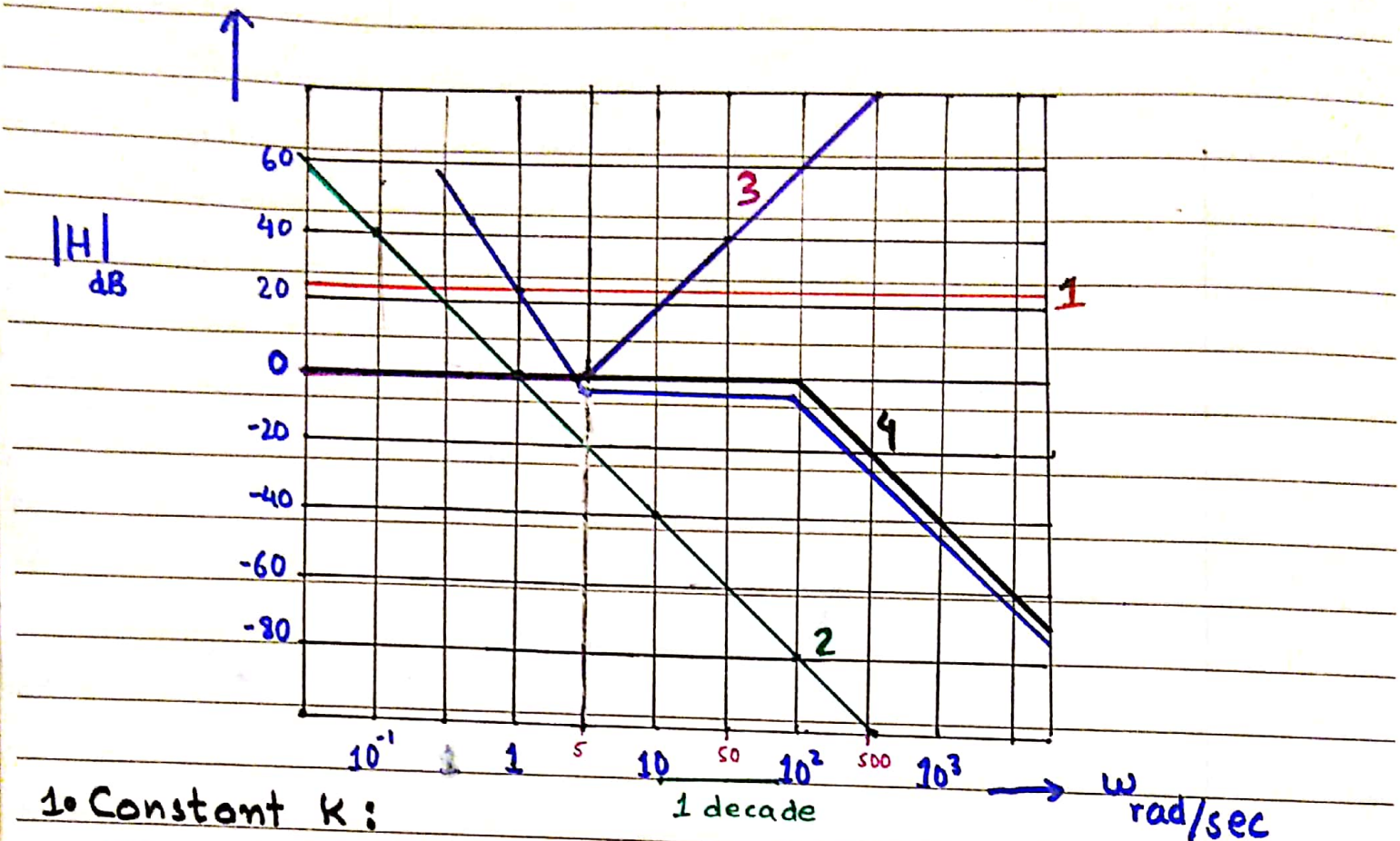
Day / Date Q4



1. Constant K :

— at $20\log_{10}(25) = 27.9 \simeq 28$

Constant Phase 0° at (+) K

2. Real System Pole $\left(\frac{1}{j\omega}\right)^n$:

— at $20\log_{10}(1) = 0$

$\left(\frac{1}{j\omega}\right)^2$ -20 dB/decades Square so, -20×2 = -40 dB/dec decay (-) slope

3. Conjugate terms from Quadratic zero :

— at meaningful frequency = 5

By compairing ;

$$\frac{j^2\omega^2}{\omega_0^2} + 2\zeta\frac{\omega}{\omega_0} + 1$$

Quradratic zero in numerator $= \left\{\left(\frac{j\omega}{5}\right)^2 + j^2\frac{3}{5}\cdot\frac{\omega}{5} + 1\right\}$

rise Per decade by 40 decibels. NOTE: Here, 5×10 = 50 next decade

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when 50 decades passess our quadratic zero rises 40 decibels by imaginary axis. Then furthur, $50 \times 10 = 500$ decades later, slope rise to 60 dBs and so on.

4. Complex Conjugate pole:

/ Quadratic Pole:

— at meaningful frequency = 100

By comparison,

In denominator, we have a quadratic Pole

$$\left\{\left(\frac{j\omega}{100}\right)^2 + j2 \cdot \frac{8}{10}\,\frac{\omega}{100} + 1\right\}$$

So a straight line, uptill 100 w/(radsec), then decays by -40 dB/dec to 10^3 and so on.

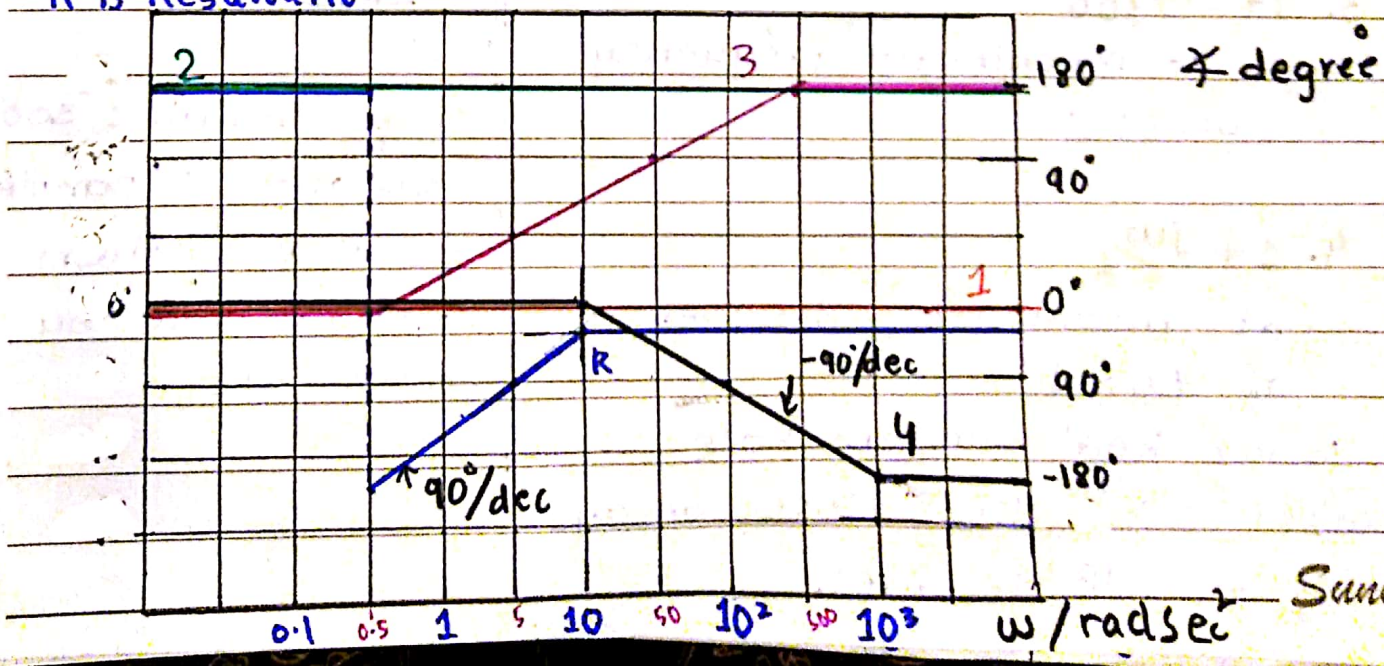
Now,

Notice Red and green line are intersecting both are non-zero dBs so add them: Red line will give a 7 dB off set to green line each time.

Blue (–) line is resultant.

PHASE PLOT:

R is Resultant.



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Q5: $$H(s) = \frac{10s(s+300)}{(s+1)(s^2+6s+400)}$$

$$H(jw) = \frac{10(jw)300\left(1+\frac{jw}{300}\right)}{(jw+1)400\left(\frac{jw}{20}\right)^2+j\frac{6}{20}\frac{w}{20}+1)}$$

$$H(jw) = \frac{30jw\left(1+\frac{jw}{300}\right)}{4\left(1+j\frac{w}{1}\right)\left(1+\frac{6}{20}\left(\frac{jw}{20}\right)+\left(\frac{jw}{20}\right)^2\right)}$$

$$H(jw) = \frac{7.5\,jw\left(1+jw/300\right)}{(1+jw)\left(1+\frac{6}{20}\left(\frac{jw}{20}\right)+\left(\frac{jw}{20}\right)^2\right)}$$

1. k Constant :

—— at $20\log_{10}(7.5) = 17.5$

2. jw : Real System Zero (jw) :

—— at $20\log_{10}(1) = 0$

3. $1+jw/300$

—— at meaningful frequency $w=300$

4. $1+jw/1$

—— at meaningful frequency of $w=1$.

Being Real System Pole after $w>1$ the slope decays by -20 dB/decades.

SLOPES
Constant phase 0° at (+) k value
jw = +20 dB/dec rise slope from zero.
Slope remains 300° constant (0° parallel to w axis) then slope will rise by 20 dB/ dec

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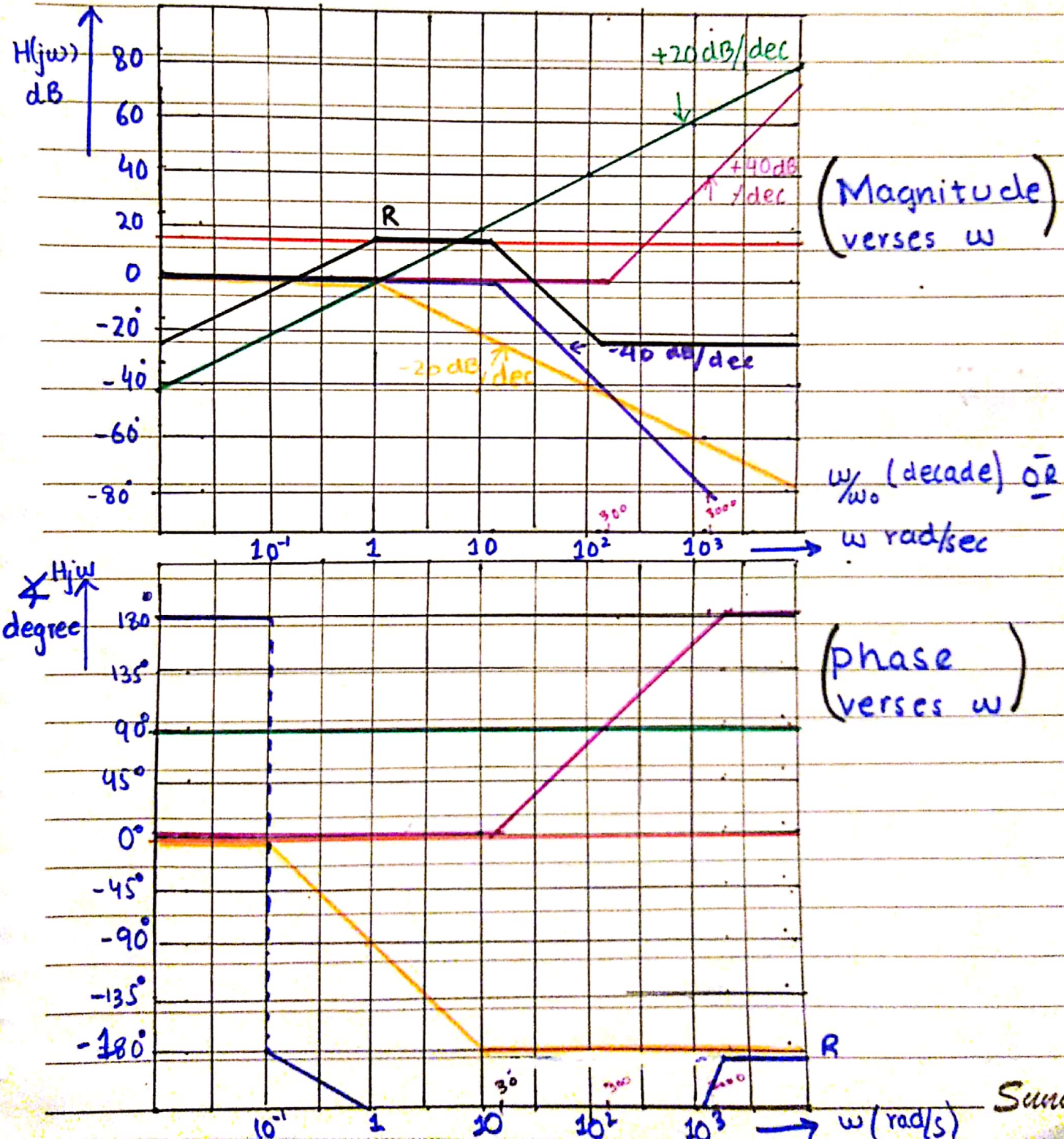
Quadratic Pole:

— at meaningful frequency $\omega = 20$ slope decays by -40 dB/decades, after $\omega > 20$.

— Resultant Plotting:



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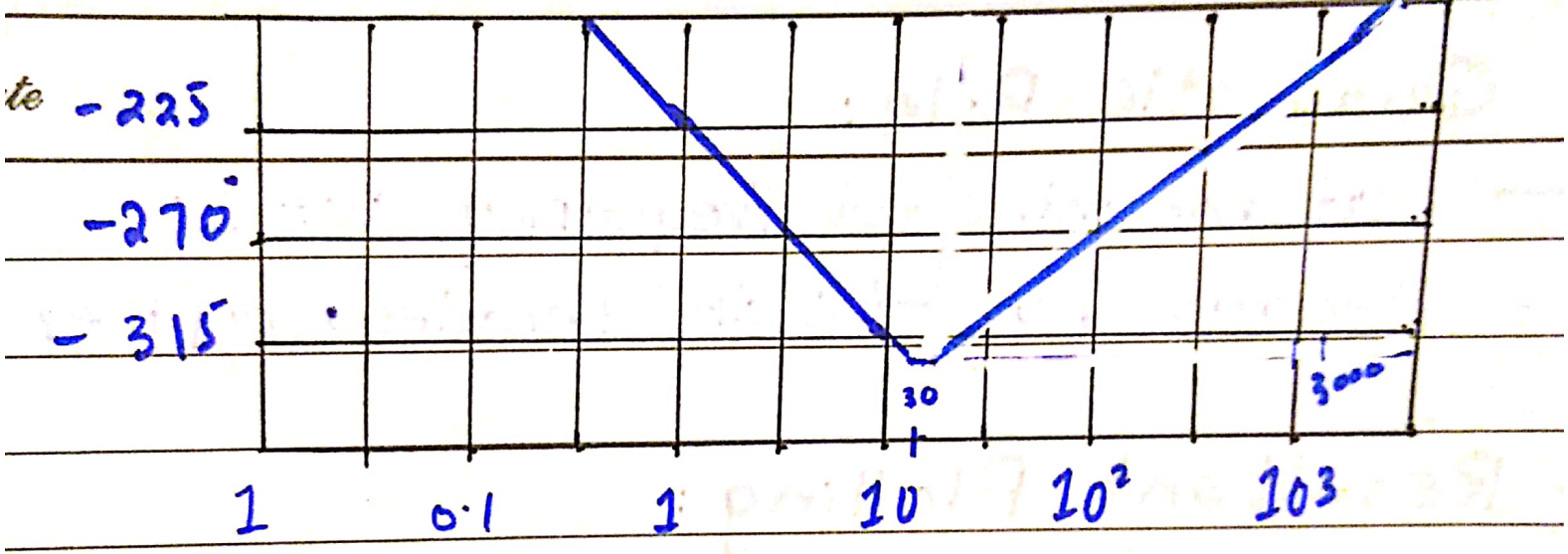

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