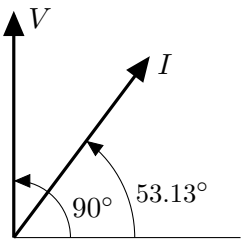
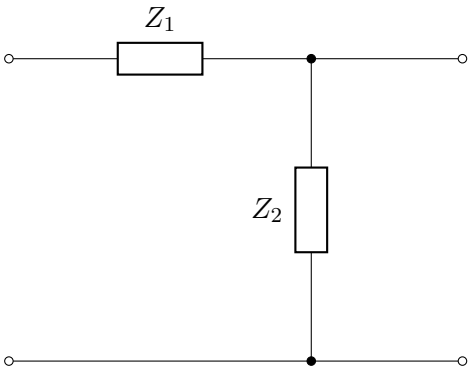
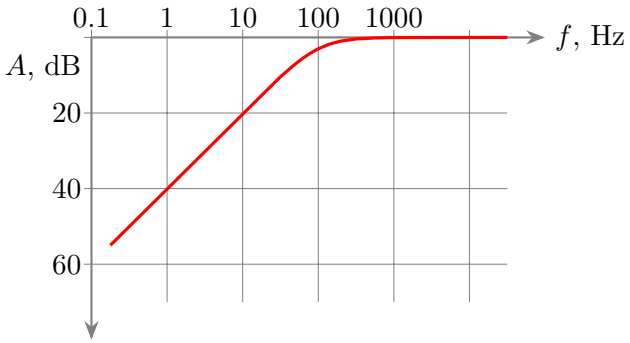
(4) **1.** Shown is the voltage-current phasor diagram for a two-element series circuit at angular frequency 300 rad/s. What are the two elements and their values if the phasor magnitudes are 200 V and 20 A?



(4) **2.** The circuit shown has the following attenuation factor:



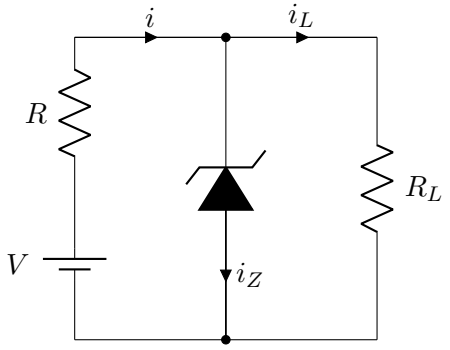


(a) What type of circuit is this?

(b) What circuit components Z_1 and Z_2 could you choose? Is there more than one way to obtain such attenuation factor A ?

(c) Sketch the phase φ of V_{out}, relative to V_{in}, as a function of frequency f.

(4) **3.** This is a *voltage regulator* circuit, providing a constant voltage to the load R_L. Here, $R = 1$ kΩ and $V = 25$ V. The maximum rated current through the 15-V Zener diode is 150 mA.



(a) Over what range of R_L values is the regulator useful?

(b) For a constant $R_L = 5.0$ kΩ, over what range of input voltages V can regulation be achieved?

(2) **4.** For *voltage* gains of 45 dB, 2.3 dB, -5.4 dB, calculate the multiplicative gain values, *i.e.* $|V_{\text{out}}/V_{\text{in}}|$. Repeat, interpreting the values as *power* gains.

(3) **5.** Use $R_f = 1000\,\Omega$ and calculate the values of R_1, R_2, R_3 such that

$$V_{\text{out}} = -(V_1 + V_2 - V_3)$$