ECE 523/421 – Analog Electronics

Lecture 23: Feedback: Negative Feedback Properties

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Review of Last Lecture

- **Feedback and Signal Flow Diagram**
- **Basic Properties of Negative Feedback**

Today's Lecture

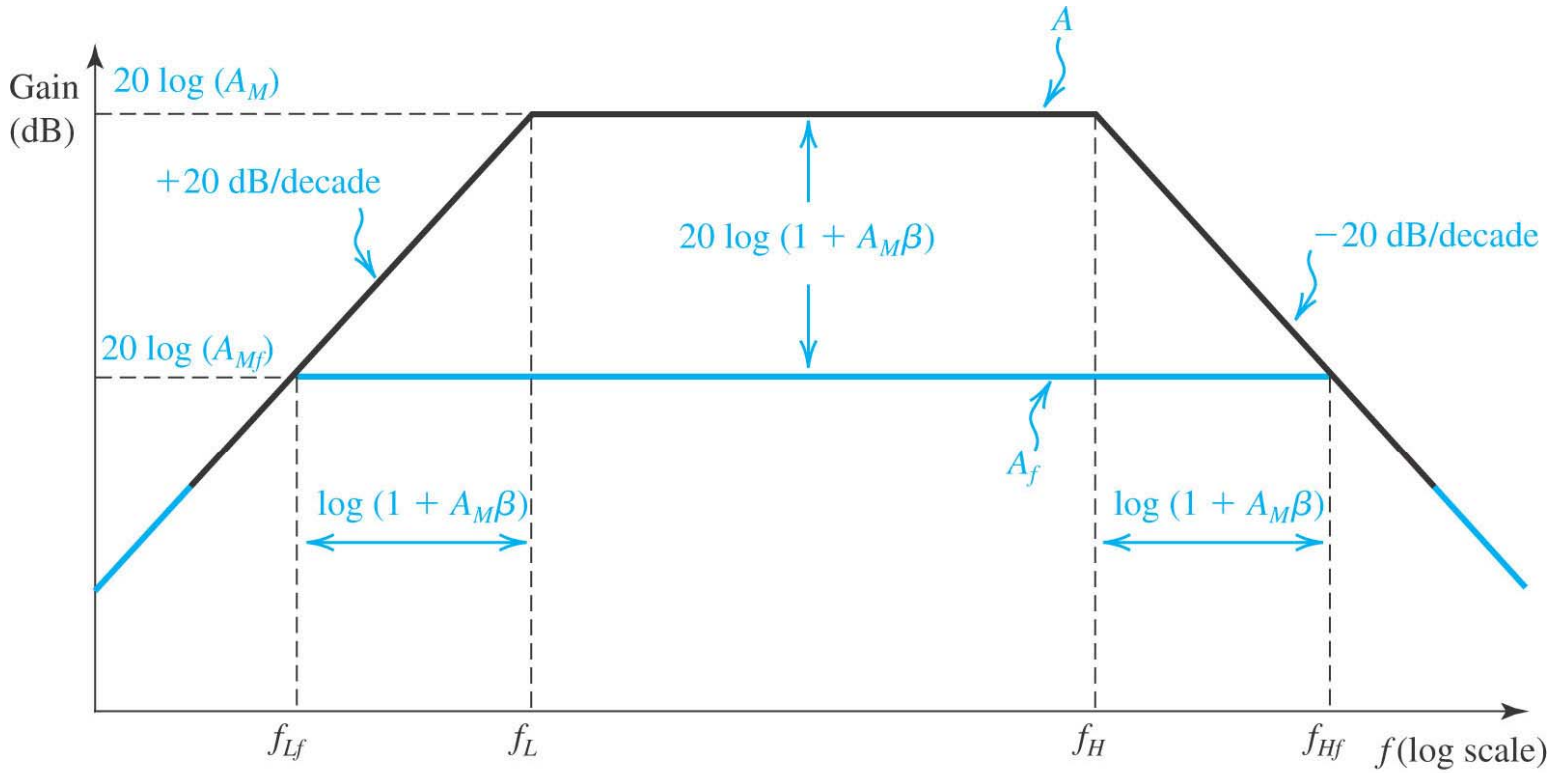
- **Properties of Negative Feedback**

Gain Desensitivity

$$A_f = \frac{A}{1 + A\beta}$$

$$\frac{dA_f}{A_f} = \frac{1}{(1 + A\beta)} \frac{dA}{A}$$

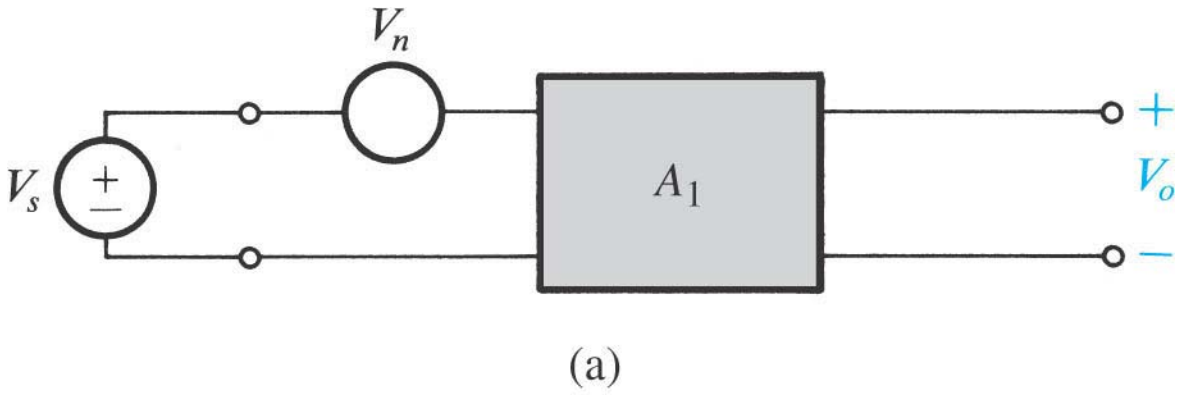
Bandwidth Extension



$$f_{Lf} = \frac{f_L}{1 + A_M\beta} \qquad A_{Mf} = \frac{A_M}{1 + A_M\beta} \qquad f_{Hf} = f_H(1 + A_M\beta)$$

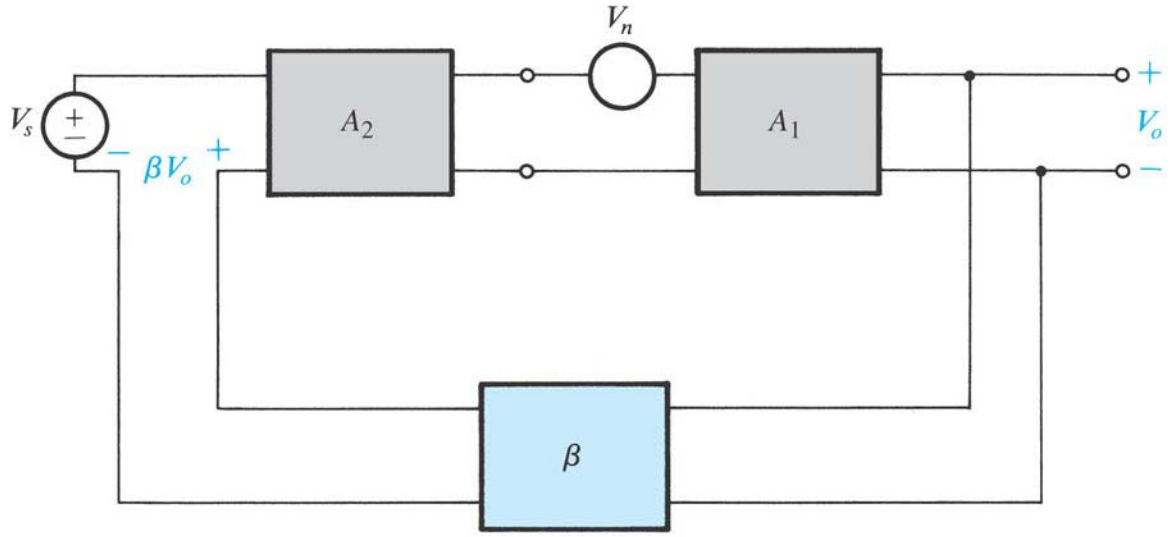
$$A_f = \frac{A}{1 + A\beta} \quad \text{where} \quad A(s) = \frac{A_M}{1 + \dfrac{s}{\omega_H}} \quad \text{or} \quad A(s) = \frac{A_M s}{\omega_L + s}$$

Interference Reduction



(a)

$$\frac{S}{I} = \frac{V_s}{V_n}$$



(b)

$$\frac{S}{I} = \frac{V_s}{V_n} A_2$$

Nonlinearity Reduction

$$A_{f1} = \frac{1000}{1 + 1000 \times 0.01} = 90.9$$

$$A_{f2} = \frac{100}{1 + 100 \times 0.01} = 50$$