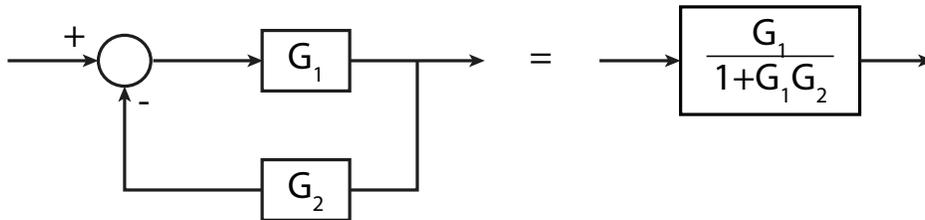
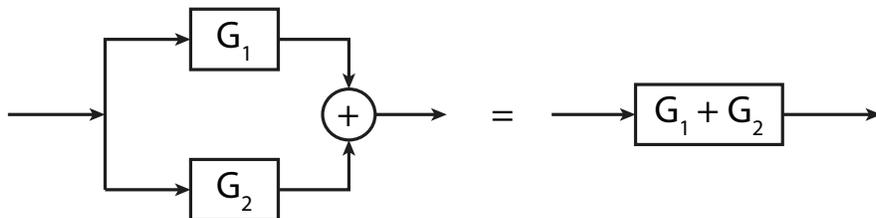
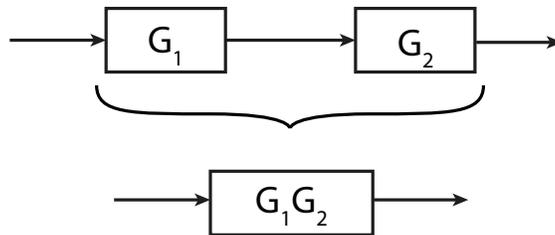
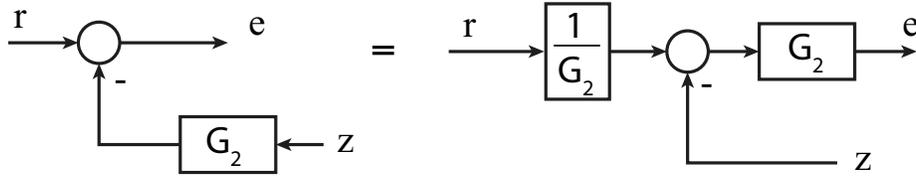


16.06 Principles of Automatic Control
Lecture 4

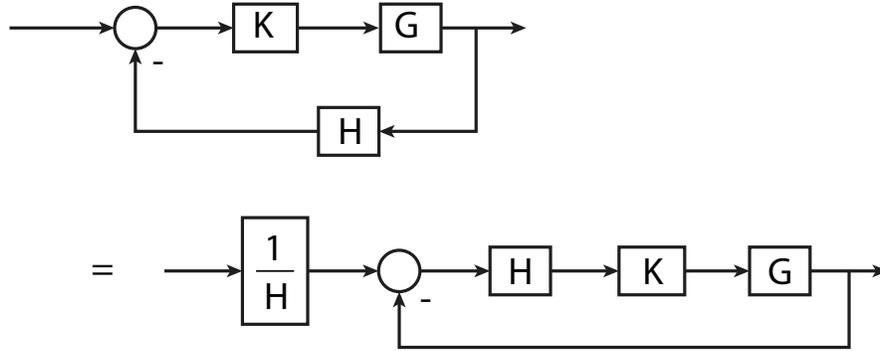
Block Diagram Manipulations:



The gain of a single loop feedback system (with sign “-1” in the loop) is the forward gain divided by the sum of 1 plus the loop gain.



So,



Mason's Rule:

$$H(s) = \frac{1}{\Delta} \sum_i H_i \Delta_i$$

$H(s)$ = closed-loop transfer function

Δ = system determinant

$$= 1 - \sum \text{all loop gains}$$

$$= + \sum (\text{products of 2 loops that don't touch})$$

$$= - \sum (\text{products of 3 loops that don't touch})$$

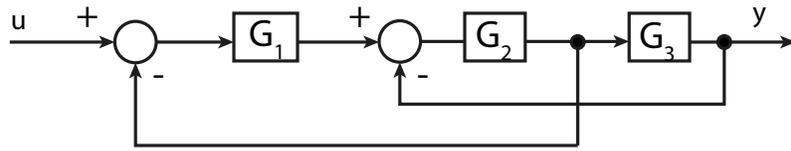
= ...

$H_i = i^{\text{th}}$ forward path

Δ_i = determinant of i^{th} path

= value of D for that part of diagram that does not touch path i

Example



$$H(s) = \frac{G_1 G_2 G_3}{1 + G_1 G_2 + G_2 G_3}$$

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