

Series Rule

Consider these two complex equations:

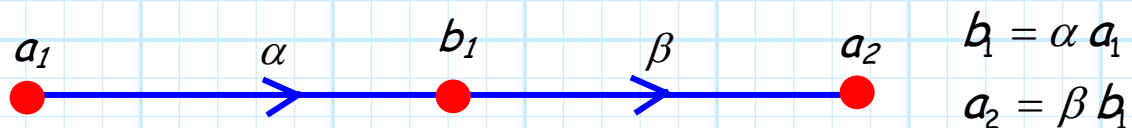
$$b_1 = \alpha a_1 \quad a_2 = \beta b_1$$

where α and β are **arbitrary** complex constants. Using the **associative property** of multiplication, these two equations can be combined to form an **equivalent set** of equations:

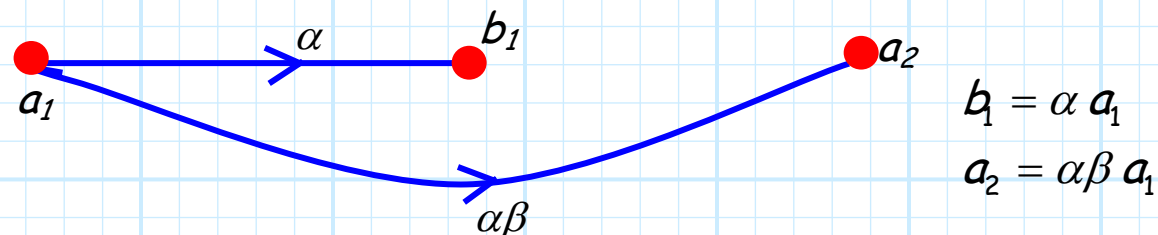
$$b_1 = \alpha a_1 \quad a_2 = \beta b_1 = \beta(\alpha a_1) = (\alpha\beta) a_1$$

Now let's express these two sets of equations as **signal flow graphs**!

The first set provides:



While the second is:



Q: Hey wait! If the two sets of equations are **equivalent**, shouldn't the two resulting signal flow graphs likewise be equivalent?

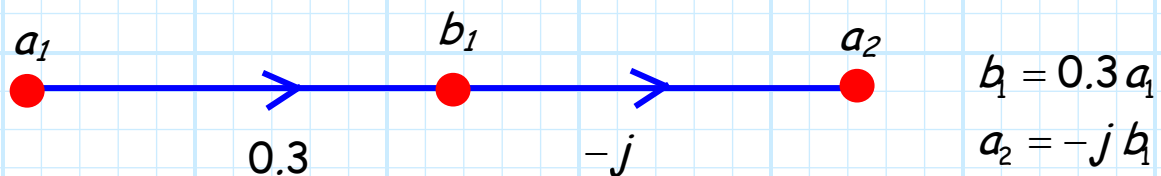
A: Absolutely! The two signal flow graphs are indeed **equivalent**.

This leads us to our **first** signal flow graph **reduction rule**:

Rule 1 - Series Rule

*If a node has **one** (and only one!) incoming branch, and **one** (and only one!) outgoing branch, the node can be eliminated and the two branches can be combined, with the new branch having a value equal to the product of the original two.*

For **example**, the graph:



can be reduced to:

