

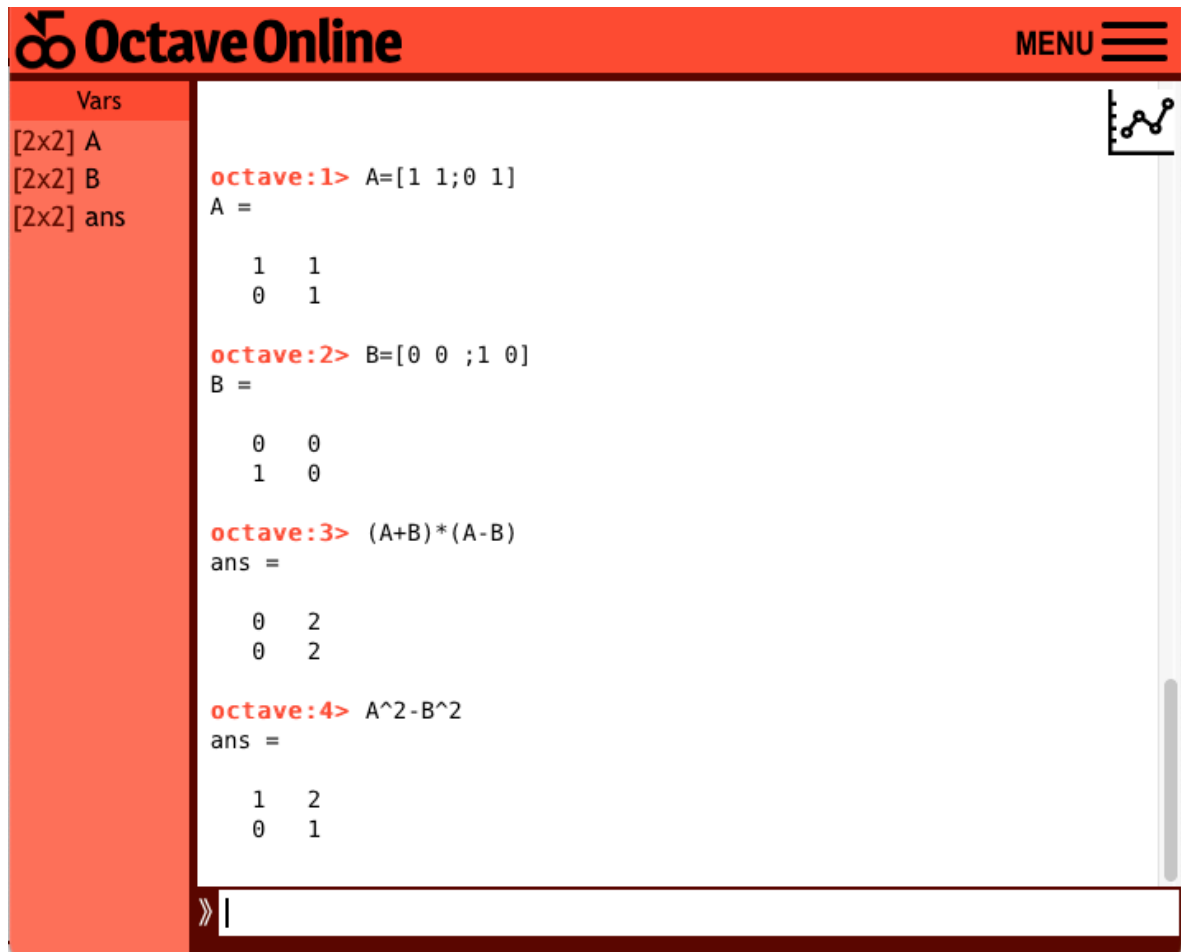
## Section 1.3 Matrices and Their Algebra

43.

$$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$$
$$(A+B)(A-B) = \begin{bmatrix} 0 & 2 \\ 0 & 2 \end{bmatrix}, A^2 - B^2 = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$$

Since  $(A+B)(A-B) = (A^2-B^2) + (BA-AB)$ , we know that  $(A+B)(A-B) = (A^2-B^2)$  only if  $BA - AB = 0$ . Therefore, the state holds only under the conditions that  $A, B$  are commutative.

p.s. You can using <https://octave-online.net> to check your example as below:



The screenshot shows the OctaveOnline web interface. On the left, a sidebar lists variables: [2x2] A, [2x2] B, and [2x2] ans. The main area displays the following Octave commands and their outputs:

```
octave:1> A=[1 1;0 1]
A =
    1    1
    0    1

octave:2> B=[0 0 ;1 0]
B =
    0    0
    1    0

octave:3> (A+B)*(A-B)
ans =
    0    2
    0    2

octave:4> A^2-B^2
ans =
    1    2
    0    1
```

The interface includes an Octave logo, a 'MENU' button, and a small graph icon in the top right corner. The bottom of the interface shows a command prompt with a double arrow and a vertical bar.